PARKING

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FOREWORD

No phase of highway transportation today receives more attention than vehicular parking. In 1942 the Eno Foundation published a report entitled "The Parking Problem—a Library Research." That study involved the collection and review of certain aspects of parking and terminal problems as they existed in urban areas. The demand for the monograph was so great that the issue was exhausted by the end of 1945.

The report which follows "Parking" is a revision of the initial parking study of the Foundation. Newer information and references on recent surveys and investigations have been added, and substantial changes made in arrangement and organization.

While no original investigations or researches have been conducted in the preparation of this report, it covers, we believe, the most important aspects of parking demands, practices, and treatments. For a field as broad as parking, it is not possible to develop comprehensive coverage of all aspects in a report of this size. Basic facts taken from available reports and publications are presented herein with due credit to authors and publishers. Properly interpreted and applied, the practices and policies developed in cities and states throughout the country should be valuable to public authorities and others in dealing with parking problems in their jurisdictions.

The serious nature of parking on rural roads has been recognized: a chapter on the subject is included. A carefully selected bibliography provides added coverage of various components of the whole parking problem.

The Eno Foundation is earnestly working to keep abreast of new developments in the parking and terminal fields so that supplements or further editions of this report can be issued from time to time. Contributions of survey data, new techniques, and general comments on the subject will be greatly appreciated.

To all those who contributed materials and suggestions for review and use in the preparation of this and the first parking bulletin, the Eno Foundation wishes to express its sincere appreciation.

THE ENO FOUNDATION FOR HIGHWAY TRAFFIC CONTROL, INC.

CHAPTER I

THE PARKING PROBLEM

Background of the Parking Problem

Transportation is not complete within itself. It is a means of attaining an objective and, being merely a component part of traffic, is not efficient unless adequate parking and terminal facilities are provided. Lack of such facilities may seriously affect the entire community as to land usage, urban finances and municipal development. Every city has a dual obligation of moving traffic and providing adequate terminal facilities.

The provision or lack of provision of parking and terminal facilities has a marked effect upon the income-producing values of property located within the affected area. This may be reflected in tax returns. Adequate parking, terminal and free access facilities are vital to the business health of a community.

The development of the parking problem and the varied results it has produced is an interesting study of automotive transportation. This study, of course, would not be limited to the United States. However, the various stages of the problem which are illustrated by conditions in this country serve to typify significant changes and developments.

Origin of Angle Parking

As settlements and towns grew, the "general store" came into being. The proprietors of these stores set a line of posts, to the tops of which a horizontal pole was fastened, in front of their establishments—a hitching rack. Patrons headed their animals and teams up to the rack and tied them to the horizontal pole. This was the origin of what today is termed "angle parking." As a general rule,

the users of the hitching racks had come to town for personal and business purposes, and contrary to modern times, had little or no regard for time.

Settlements grew into towns and towns into cities, and as the growth progressed, streets, other than the original highway, had to be provided to give access to places off the main highway. As a rule, early settlers were a frugal lot and considered that land devoted to streets was a waste if more than barely enough to satisfy their needs was used. One of the criteria by which street widths in the towns were determined seems to have been the space required to allow a vehicle to pass another one which was backed to the curb for loading or unloading or, on business streets, to pass vehicles at the hitching racks. These considerations, while they provided ample accommodation at the time they were built, fall short of meeting modern requirements.

Parking Problems Developed With Autos

As time passed, blacksmith shops became filling stations and automobile repair shops, barns and wagon sheds became garages, the country and small town stores grew, farmers found they could dispose of a good deal of their farm products and handicraft through roadside stands, having in mind that the nearer they were to the moving traffic the better their business would be.

Superimposing modern automotive traffic on this system of "horse and buggy" city streets created a chaotic condition which few, if any, cities have solved. The rapid acceptance of the automobile is evidenced by the fact that when the United States entered the second World War, there were about 34,000,000 vehicles in use in this country. Since the average motor car travels nearly 9,000 miles per year, the tremendous number of vehicle miles driven each year is readily apparent.

The effect upon city traffic conditions which this volume of traffic creates is made more implicit by the Public Roads Administration in its report "Toll Roads and Free Roads"[1] in which it is

[1] *Toll Roads and Free Roads.* House Document No. 272, 76th Congress, First Session, Government Printing Office.

pointed out that of the total miles covered by all vehicles, 30 per cent are on urban streets, and of the total miles covered by all vehicles registered in cities of 100,000 population or over, approximately 60 per cent are on urban streets.

With the lifting of wartime restrictions on vehicular travel, there was a sharp increase in vehicular miles traveled. As more new vehicles are produced, the situation will continue to become more acute, particularly in urban areas.

Traffic Movement First

Courts have always upheld the contention that the primary function of public ways is that of moving traffic, not the storing of vehicles.

A distinction between parking and storing vehicles was made as early as 1812 by the great English jurist Ellenborough, Lord Chief Justice of England. It was in the case of Rex vs. Cross in which the defendant was indicted for allowing his coaches to remain an unreasonable time in the public street. The Court said: "Every unauthorized obstruction of a highway to the annoyance of the King's subjects is a nuisance. The King's Highway is not to be used as a stable yard."

Other Regulations Necessitated

Another legal factor involves the right of access to private property, which means it is required of public officials that they allow loading and unloading operations even where it may be possible to regulate or prohibit curb parking.

In some Colonial towns it was found necessary to adopt restrictive measures within sixty or seventy years after their founding regarding "tethering animals" and "standing vehicles."

The reasoning of these early regulations has been followed in modern regulations controlling the use of curb space for parking. Regulations are aimed at making the best use of available curb space and accommodating as high a percentage of road users as possible.

Even though such legal interpretations could be upheld and enforced, it would still be impossible to accommodate at the curb more than a fraction of the vehicles demanding parking space in downtown business districts.

Off-Street Parking Early Recognized

That off-street parking facilities are necessary was recognized very early in history. Along the roads, in towns and in early American cities, there were numerous places into which teamsters and all day visitors could drive their teams where they would be "put up and baited," in other words, unhitched, put into a stable and fed. In many cases a hotel was operated in connection with these enterprises.

It is true that such off-street facilities of the early days did not come about for the same purpose as modern off-street facilities. However, it must be recognized that off-street parking facilities are at the present time being operated in connection with, and as essential parts of, important businesses. In both cases, the availability of attractive and convenient storage spaces looms as a basic factor to successful business.

Concentrated municipal areas originated in the era of horse-drawn vehicles and limited transport facilities. Mass transportation by street cars, buses, subways and elevated railways, justified a vertical development, hence the skyscrapers. The perfection of the automobile has provided freedom of movement which has resulted in a horizontal municipal development. This has also resulted in business shifts.

The results of these shifts are to be seen in every city and are evidenced by slum districts, run-down former business areas, vacant stores, and lots from which buildings have been removed to lower tax payments. These conditions have been brought about largely through lack of recognition of changing conditions in the means of transportation and failure to make proper provisions for complete transportation facilities.

The Parking Problem As It Exists Today

General Statement of the Problem

The parking problem is not only a very old one, but it is one of the most acute problems in all modern cities. There is perhaps not a city in the United States in which it is not one of the most serious problems. Not a single city has completely solved its parking problem. Many have made noteworthy advances and have developed parking facilities which are much more adequate in terms of the total problem than others, but with the return of highway traffic to pre-war levels, even these cities will find their facilities over-taxed and the difficulties of the parking problem will prove to be of major concern to citizens and officials alike.

Because of the very nature of the problem and the important economic considerations involved, it will be almost impossible to bring about a complete solution in the oldest cities. Even in newly planned and developed cities, it is not likely that complete solutions will be brought about. It is therefore necessary that public officials and private interests devote their resources to the most effective techniques and facilities for meeting parking demands.

Groups and Interests Affected By Parking

One of the reasons for the complexity of the parking problem is that a large number of individuals, agencies and interests are directly concerned with it. In some cases, this concern is limited to the selfish attitudes and to even the whims of individual road users. In others, large investments and business interests are at stake.

Merchants—In the downtown districts of every city, the group which takes the greatest interest in the parking problem is composed of the retail merchants. Unfortunately, many of them feel that the success of their businesses depends primarily on the availability of parking spaces in front of their shops. When changes are suggested, this group invariably protests severe regulation or prohibition of curb parking, usually offering the reason that such regulation would greatly reduce their businesses and therefore the values of their business establishments.

In practice, the objections offered by merchants to controlling curb parking are often proven incorrect when engineering studies and changes are made. Such a study was made in the city of Philadelphia during the month of December, 1945.[2] A 50 per cent daytime sample of all cars parked in the central area was obtained. In addition, 5,000 shoppers were interviewed in sixteen of the largest department and variety stores.

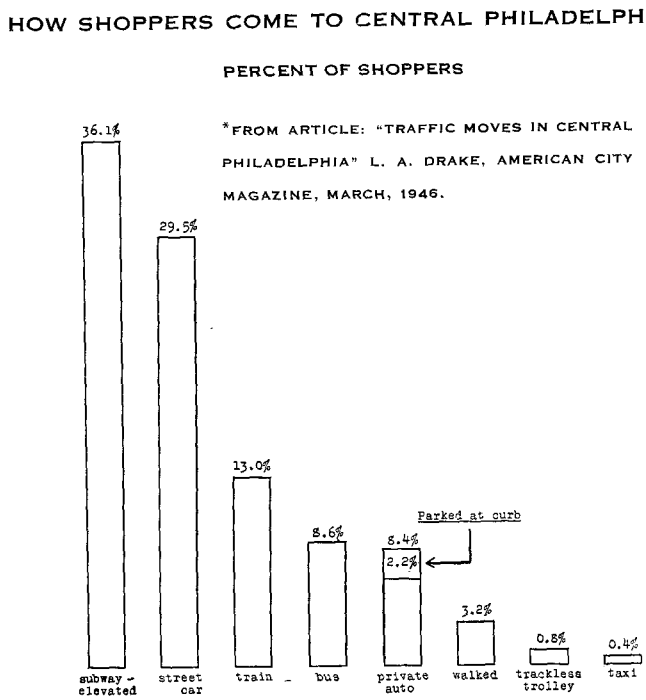


FIGURE 1—How Shoppers Come to Central Philadelphia

The results of these studies were compiled and Figure 1 was prepared. This graph affords a picture to the merchant of just how numerically unimportant the curb parkers are in comparison to other customers. With the full support of the merchants, curb parking was banned from 8:00 A. M. to 6:00 P. M. on nearly all

[2]*Traffic* Moves *in Central Philadelphia;* Leonard A. Drake, American City Magazine, Vol. LXI, No. 3, March 1946.

the one-way streets in downtown Philadelphia. Elsewhere in the district, parking was limited to one-half hour, as against the one and two-hour regulations formerly in force.

Motorists—The desires and attitudes of motorists relative to parking are the same natural desires as toward other phases of the traffic problem. They want the greatest possible convenience with a maximum of safety, a minimum of delay and the least possible expense. Translated into simple terms, what the average motorist looks for always is to find an adequate space at the curb directly in front of the point at which he desires to transact business. Obviously, such a situation is impossible and in the case of most businesses, only a very small percentage of customers can be provided such a convenience.

Property Owners—The attitudes of owners of retail properties, particularly those in congested districts, are quite similar to the attitudes of retail merchant groups. They feel that the value of their real estate is dependent to a large extent upon the accessibility of properties through curb parking spaces. Most of them resist attempts to prohibit parking at the curb. Few are willing to go to the expense of providing off-street facilities for their employees and patrons.

Commercial Fleets—Problems created by the movement of merchandise are directly related to parking. It is necessary to have ready access to roadways for the receipt and delivery of freight. This frequently necessitates special consideration to delivery trucks and other commercial vehicles. These groups try to have a disproportionate part of available curb space in downtown districts set aside for pick-ups and deliveries. Measured in terms of total space, the area demanded by these groups is frequently excessive in terms of the space which can be granted to motorists.

Any attempt to solve the parking problem must take into account the need for convenient loading areas for trucks. Even though off-street facilities may be provided which are adequate and convenient, experience has proven that a large percentage of these operations must still take place at the curb.

Taxis—Zones or loading areas at the curb are provided for taxis in the downtown district of every city. These zones might otherwise be used by individual motorists and therefore must be reckoned with in connection with the curb parking problem. Practices and plans which have been used by various cities in accommodating and controlling the use of curb spaces by taxis must be reviewed.

Emergency Vehicles—Emergency vehicles, particularly those used in various phases of public safety activities, such as police and fire, are also concerned with curb parking conditions. They are not so interested in the availability of spaces for the parking or storage of vehicles as in the interference which may be created by parked vehicles to the efficient conduct of their various functions. Adequate "no-parking" protection in the vicinity of fire hydrants, sufficient width between parked vehicles for free movement of over-sized trucks, and adequate lanes for the laying of fire hose are some of the factors that public safety groups will insist upon when changes are made in curb parking.

Mass Transportation—Consideration must be given to the efficient operation of mass transportation vehicles. Vehicles parked too close to street intersections or authorized stops will prevent buses from pulling to the curb to take up and set down passengers, and so block moving traffic by extending into other than the normal parking lane.

If street car and bus service could be made more comfortable, frequent, convenient and rapid, through the reduction of traffic interference, more people would use them because such transportation is cheaper than operating a car. The increased usage of mass transportation methods would reduce car usage and so relieve the parking situation. The question arises as to how this change in habit can be brought about. Some cities have tried to attain this desired result through prohibiting all curb parking in certain areas. In other cities, such as Philadelphia, Detroit, and Cleveland, the transit companies have been partially successful through providing parking spaces in outlying districts and charging a small fee which includes transportation into and out of the congested area.

Accidents Involving Parked Cars

In addition to problems of congestion and the detrimental effects produced thereby, vehicles parked, or in the process of entering or leaving parking spaces, as well as those slowing or stopped in the roadway, create bad accident hazards.

All Accidents—The following table illustrates the portion of all vehicle accidents during 1945 attributed to parked cars.

TABLE I

Motor Vehicle Traffic Accidents, 1945[3]

Location and Movement	State-wide Fatal (24 States)	Urban		Rural	
		All Accidents (251 Cities)	Fatal (251 Cities)	All Accidents (9 States)	Fatal (9 States)
One car parked					
Proper location	0.8%	8.6%	1.3%	1.8%	0.6%
Improper location	1.6%	0.6%	—	2.7%	1.9%
One car leaving parked position	0.1%	5.0%	—	1.1%	0.1%
Total accidents—parked vehicles	2.5%	14.2%	1.3%	5.6%	2.6%

Urban Accidents—Table II shows the relation between parking accidents and all accidents as well as the detailed causes of parking accidents for ten large cities in the United States.[4] It should be noted that accidents involving parked cars constitute from 3.5 per cent to 27.9 per cent of all accidents.

Pedestrian Accidents—In 1945, 8 per cent of all fatal pedestrian accidents involved pedestrians who were killed in the act of coming into the roadway from behind parked cars. Among the pedestrians injured in 1945, 10 per cent were injured under similar conditions.

[3] *Accident Facts*, 1946 Edition, National Safety Council.

[4] *Accidents Due to Parking in Congested Areas*, L. E. Bender, Thesis, Bureau of Highway Traffic, Yale University, 1940.

TABLE II

ACCIDENTS DUE TO PARKING IN LARGE CITIES

	WASHINGTON	ST. LOUIS	PORTLAND	KANSAS CITY	BALTIMORE	WILMINGTON	OAKLAND	FLINT	PHILADELPHIA	PITTSBURG
	PER CENT OF TOTAL									
INVOLVING TWO MOTOR VEHICLES										
View obstructed by parked car	7.8									
Parking	8.8									
Slowing down or stopping	31.2	27.7		25.2	8.7	22.8		12.3	18.8	
Starting from curb or parking position	27.8	42.5		18.8	35.8	29.4	81.0		25.1	37.7
Improper parking							19.0			10.7
Double or prohibited parking			44.3			47.8	1.7			
Parked or standing still				56.0	55.5			64.0	56.0	48.2
Parked too close to corner		4.8								
Parked without lights		2.6								
Parked in intersection		1.1								
Was backing	24.4	7.9						22.0		
In and out of drive or alley		13.4								3.4
Car standing in roadway			55.7							
TOTAL PARKING ACCIDENTS	1019	910	490	1283	3185	136	430	4604	1235	289
TOTAL ALL ACCIDENTS	10431	7873	16145	8831	19318	1387	4359	16676	24266	4374
PER CENT PARKING ACCIDENTS OF TOTAL ACCIDENTS	10.1	11.6	3.5	14.6	16.3	9.8	9.9	27.9	5.1	6.4

[4] *Accidents Due to Parking in Congested Areas*, L. E. Bender; Thesis, Bureau of Highway Traffic, Yale University, 1940

Other Parking Accidents—Information and statistics should be sought and used showing the influences of specific involvements of other parking, unparking, or standing practices on collisions. The following should be studied: double parking, collisions involving stalled and stopped vehicles, "run-away" vehicles, parking violations influencing accidents, involvement of transit vehicles in parking accidents, the relationship of access control to parking, and influences of road design on parking accidents.

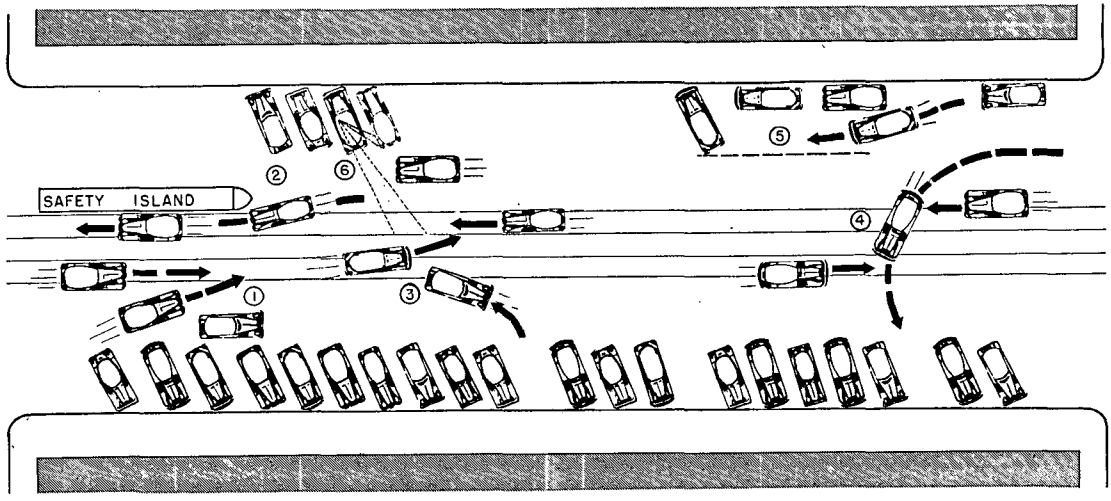
Accident Studies Important—Differences in terminology and in analysis methods of various cities and states make it difficult to develop complete data showing the involvement of parked vehicles in accidents. The above facts and others, however, show the involvement of parked vehicles in a sufficient number of accidents to justify careful study and consideration of the parking problem from the standpoint of accident hazards alone. It is often possible to get parking proposals accepted more readily on the basis of accident facts than on other facts, because of the great public concern over traffic accidents.

Figure 2 is typical of the emphasis given to accidents involving parked cars in a survey made in Chicago.

Economic Losses Due to Shortage of Parking Facilities

It is readily recognized that the unavailability of parking spaces in business areas creates economic problems. When parking directly affects business, the economic influences are direct and can be readily measured and valued. In most cases, however, these influences are more indirect and become difficult to measure. Their effect is felt only over long periods of time and in many diverse ways. Because of this, there is not too much specific information available regarding the matter of economic losses due to parking problems. All parking studies and changes, however, should take them into account as their proper consideration is necessary in any satisfactory solution of the parking problem. It is obvious, too, that more changes should record economic and business trends which can be related either directly or indirectly to parking so

ACCIDENT HAZARDS CREATED BY ILLEGAL PARKING PRACTICES ON ROOSEVELT ROAD, JEFFERSON STREET TO BLUE ISLAND AVENUE



① A double parked vehicle blocks the street so that only one lane is open to moving traffic on that half of the street.

② Vehicles parked in a No Parking zone opposite a safety island cause most traffic to drive to the left of the island on the street car tracks.

③ A vehicle backing from an angle parking space blocks one-half of the street and frequently forces traffic to enter the wrong side of the roadway.

④ Angle parking encourages drivers to "U" turn and cross lanes of traffic while entering curb space.

⑤ A vehicle pulling out from a parallel parking space uses less street space than is required to park a vehicle at an angle with the curb.

⑥ A driver backing from an angle parking position does so with his view blocked by other parked vehicles. His range of vision through the rear window is not adequate for safe entry into a moving lane of traffic.

From the Report: "Effect of Roosevelt Road Parking Practices on Public Convenience and Safety." Published by the Chicago Surface Lines, September 1939

FIGURE 2—Accident Hazards Created by Illegal Parking

as to provide others with more effectual data for general application and use.

This economic health is threatened through a direct financial loss in two ways:

1. A loss to the vehicle driver and his passengers due to time lost.
2. Losses to businesses often become direct losses to the city. Decreases in land values, tax revenues and decadence in land uses are among the items which often directly reflect parking difficulties.

As part of a study made by the U. S. Public Roads Administration, included in a report on "Intangible Economics of Highway Transportation"[5] presented at the 1933 annual meeting of the Highway Research Board, the effects of inadequate parking facilities on total trip time were investigated. "Runs" were made from three points approximately six miles from a central business district destination in Washington, D. C., during the rush hour, and travel time, time spent finding a parking space, and time walking from parking space to destination were accurately measured.

The average driving speed for all "runs" for the six miles was 14.2 miles per hour. After spending 7.5 minutes finding a parking space at the curb, the overall average speed dropped to 10.8 miles per hour. After an additional 8.3 minutes spent in walking from parking space to ultimate destination, the average overall speed was brought down to 8.5 miles an hour. Thus, the reduction in speed was about 40 per cent because of time lost due to parking difficulties, or a loss of nearly sixteen minutes for each six mile trip.

Decrease in Tax Revenue—Secondly, the acute shortage of terminal facilities has also manifested itself in a decrease in city tax revenues. When property values in a business district decline, and the tax rate remains the same, it is obvious that tax revenues collected by the city must also decline. Numerous reports indicate that this situation is prevalent throughout many cities in the United States at the present time. All of these reports, according to information received from questionnaires by the American Automobile Association, list inaccessibility due to inadequate parking and

[5] *Intangible Economics of Highway Transportation*, C. A. Hogentogler, Proceedings Highway Research Board, Volume 13, 1934.

terminal facilities as one of the factors which has contributed to decentralization of business and a resultant decline in property values.

Taxes from business district properties in most cities pay a large portion of the expense of operating the city government. In the larger cities throughout the country, according to information reported in the report of the Committee on Parking and Terminal Facilities of the American Automobile Association, 1940,[6] from 10 per cent to 40 per cent of the total assessed land and property values in the city is represented in the central business district. In the city of New Haven, Connecticut, the central business district pays 20 per cent of the total city property tax on only 1½ per cent of the tax-paying area of the city.

It would seem, then, that any condition which seriously affects the tax-paying ability of the central business district of any city must be regarded with grave concern by those officials responsible for the welfare of the city. The problem of providing adequate parking facilities qualifies as a condition which, if not definitely improved, will seriously threaten the economic future of all cities.

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[6]Report of the Committee on Parking and Terminal Facilities, American Automobile Association, 1940.

CHAPTER II

PARKING CHARACTERISTICS

Types of Parker

The interests and desires of persons driving motor vehicles are many and varied and the reasons for which these drivers seek places to park their respective vehicles are equally as varied. However, persons desiring parking spaces can generally be classified in three categories, based upon the length of time for which parking space is desired.

Group I—Short Time Parker

This type of parker is generally interested in parking only for sufficient time to load or unload passengers, mail a letter, pay a bill, or accomplish some other similar errand which requires a minimum of time.

In a recent study made in New Rochelle, New York,[7] 47 per cent of all curb parkers were found to be in this group. This group of parkers was observed to park for an average of twenty minutes.

"Live" Parking—In many cases, short time parking is accomplished through "live" parking in which the driver remains in the vehicle, usually with the motor idling while a passenger leaves, transacts business or makes a delivery. Many cities permit this type of parking on streets where "no parking" prohibitions prevail, in unoccupied loading zones, and at other places where vehicles could not be left without a driver. Some cases are known in which live parking is permitted as "double parking," but such practice is not recommended.

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[7] *Parking Survey, Report and Recommendations*. New Rochelle, New York, 1946. National Conservation Bureau.

Traffic Impeded—Short time parkers are found throughout all hours of the working day and it is difficult to attempt to provide spaces to accommodate them due to the irregularity of the demand for spaces. However, if not accommodated, this type of parker may create a problem, for studies have shown that persons are willing to double park their vehicles in a position that is not only illegal but also very hazardous. This practice of double parking has the effect of eliminating one complete lane for the use of moving traffic. The effects of double parking on moving traffic are shown in Figure 3.

FIGURE 3—Effects of Double Parking on Traffic

A study made by the Transit Company in San Antonio, Texas, revealed that double parked vehicles, either directly or indirectly, contributed to 17 per cent of the bus accidents in congested areas. These collisions represent 4 per cent of the company's total for the city.

Convenience Developed—Short time parkers do not like to walk more than 500 feet from where they park to their ultimate destination. They prefer to walk a much shorter distance. Recognizing these desires, many businesses are making it possible for motorists

to transact business from their autos. Mail boxes, especially designed for auto use, are located at the curb near post offices; bank deposits can be made by use of chutes at the curb or from special drives at the bank; utility companies are providing booths and drives in order that bills can be paid without leaving the auto. Curb service at drug stores has been common in many cities for years.

Some cities report success in handling the short time parker by assigning one or two spaces per block for the exclusive use of short time parkers. This is accomplished by establishing a five or ten minute limit for these particular parking spaces. In order to be successful, this type of parking space must be conspicuously marked and there must be continuous enforcement in order to prevent misuse of these spaces.

Group II—Shopping Group

This name has been applied to the large group of persons who park for any length of time up to several hours. The group includes all types—salesmen, housewives shopping, repairmen, and others who have occasion to park for some length of time but who generally do not park for an entire working day.

Space Demands—The demand for parking spaces created by this group varies with the time of day, day of the week, and season of the year. However, it is possible to draw certain conclusions which have been found to be generally true throughout various sections of the country.

The greatest demand for parking spaces in the central business district occurs between 2:00 P. M. and 3:00 P. M. on week days, Monday through Friday. Some variance is noted with the size of cities. Those cities of over 50,000 population will usually have peaks between 11:00 A. M. and 3:00 P. M. while in cities under 50,000, the shopping peak almost always occurs after 3:00 P. M. Travel distances and time are of course the factors which influence the peaks. A study made in Detroit to determine the need for off-street parking facilities disclosed that when this peak of demand occurred, at 2:30 P. M. in this case, 172 per cent of all legal park-

ing spaces were used in the concentrated retail area of the city.[8] This means that shoppers and others were parking in illegal spaces such as fire hydrant zones, loading zones, bus stops, and other restricted spaces.

Walking Distances—Surveys have determined a definite limit to which this type of parker can be expected to walk from a parking place to his destination. At the same time that cars were parked illegally in Detroit, spaces were found empty in areas only a few hundred feet away from this concentrated retail area. The curb spaces in a slightly larger area surrounding the concentrated retail area were used only to 80 per cent capacity, and the off-street spaces were used only to 37 per cent capacity.

It is generally agreed that 1,000 feet is the maximum distance which an average person will walk from a parking space to his ultimate destination. This was verified in a recent study made in Savannah, Georgia, when it was found that 89 per cent of all parkers interviewed parked at or less than this distance from their ultimate destination.[9] This distance varies, however, with the length of time for which a person desires to park. Table III is taken from a survey made in a midwestern city and shows that a person parking for a longer period of time is generally willing to walk a greater distance than a person who is parking for a short length of time.[10]

TABLE III

CANVASS OF PEOPLE PARKED AT CURB AS TO DISTANCE THEY WERE WILLING TO WALK[10]

	PERCENTAGES WILLING TO WALK IN BLOCKS							
TIME PARKED	½	1	2	3	4	5	6	OVER 6
½ hour	2	41	36	14	4	2	1	0
1 hour	0.4	15	37	28	12	4	3	0.6
2 hours	1	6	28	29	23	6	5	2
Over 2 hours	0	2	20	33	20	13	8	4

[8]*Parking Facilities for the Detroit Central Business District;* Koch, 1939 Proceedings, Institute of Traffic Engineers.

[9]*Determining Parking Requirements by Study of Parking Habits;* Hitchcock and Willier, Highway Research Board, Vol. 24, 1944.

[10]*Parking in Downtown Rockford, Illinois;* Chicago Motor Club, January 1942.

Cruising—Cruising for parking spaces may develop an appreciable traffic flow in some districts. As pointed out above, people refuse to walk great distances from parking spaces to their ultimate destination, and prefer to cruise around the block or through the area in search of an opening at the curb or hoping to catch a vehicle leaving a parking space. Some studies of this problem have shown that from 7 per cent to 10 per cent of the vehicles on some downtown streets are cruising in search of a parking space or are awaiting a passenger whom they have brought to the area to shop or transact business.

Figure 4 indicates the extent to which some vehicles were observed passing through an important downtown intersection many times during the morning peak.[11]

Time Demands—Time demands for curb parking are fairly consistent in downtown areas. Studies indicate that about 80 per cent of the motorists desire to park one hour or less in these districts. The demand for one hour or less time varies from 60 per cent to 90 per cent of the parkers. The modal value for curb parking time requirements is generally found to be about 30 minutes. Where shoppers have been segregated from other traffic parking at the curb, it is found that time demands are greater, often three hours or more.

A recent survey conducted in Morristown, New Jersey, shows the average duration of curb parking in the downtown district to be forty minutes. Half of the cars parked twenty minutes or less, 75 per cent parked under forty minutes, 12 per cent parked over the legal limit of one hour.[12]

Group III—Long-Time Parker

If Table III can be considered as representative—and other studies have borne out these findings—then the long-time or all-day parker can be expected to walk a greater distance to his destination than other types of parkers.

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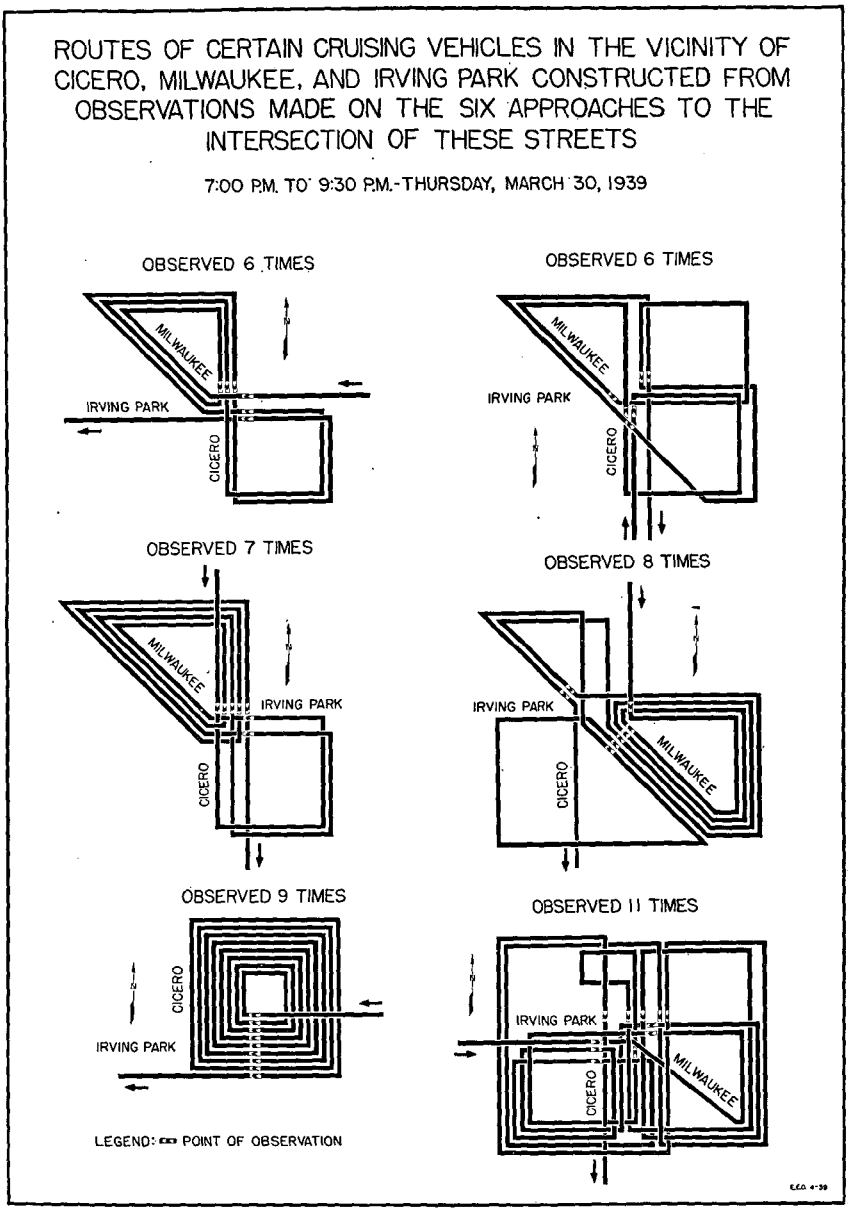
[11] *A Plan to Relieve Traffic Congestion in the Portage Park Retail Shopping Center.* April 1939, A survey by City of Chicago, Chicago Motor Club, Chicago Surface Lines.

[12] *Traffic Survey—Report and Recommendations,* Morristown, N. J. 1946 National Conservation Bureau.



From the Report: "A Plan to Relieve Traffic Congestion in the Portage Park Retail Shopping Center." A Survey by City of Chicago, Chicago Motor Club, Chicago Surface Lines, April 1939

FIGURE 4—Observed Routes of Cruising Vehicles

The long-time parking group includes persons from all walks of life who drive their private vehicles from home to their respective places of employment or business. This group must be studied and given careful consideration in any plan to improve parking conditions.

Store Employees Impose—In the early days of American towns and cities, each merchant considered it his privilege to park his own means of transportation directly in front of his business. As time went on, the merchant realized that his business would prosper if his own curb were free for use by customers, but the merchant still demanded a nearby parking place. Thus we have the practice which still exists today in some communities: one merchant parking his own car at the curb in front of his competitor's place of business. This attitude still prevails among the long-time parkers, for studies have shown a large percentage of vehicles parked for a full day to belong to employers and employees of business establishments within the same block. Activities of long-time parkers on several streets in Chicago in 1939 are shown in Figure 5.

In a recent study made in Philadelphia, curb parkers were interviewed in a sixty-four block area of the central business district. Of the group who gave business as the reason for parking in the district, over 12 per cent were the store owners themselves.[13]

Obviously, if traffic conditions are to be bettered in any community through a correction of the parking problem, this group of parkers must be given careful attention and controlled.

Recreational Parker

Movie goers and others who create amusement traffic, frequently cause peculiar parking demands. The overall demand is usually much less than that of shoppers, but in most areas it is more concentrated.

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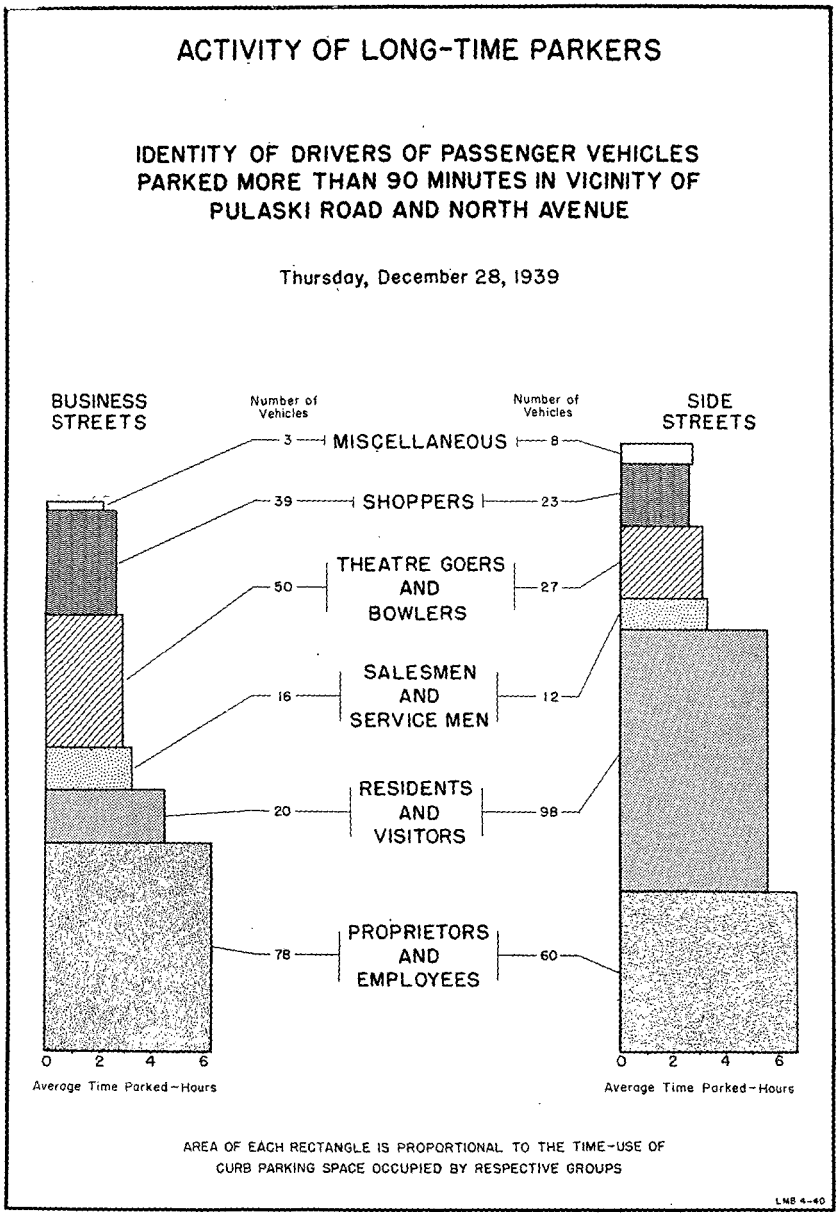
[13] *What Can Be Done About Traffic Congestion,* Robert A. Mitchell, Civil Engineering, Vol. 16, No. 6; June, 1946.



From the Report: "A Plan to Relieve Traffic Congestion in the Pulaski-North Shopping Center;" a survey by the Chicago Surface Lines, May, 1940

FIGURE 5—Activity of Long-Time Parkers

Amusement traffic peaks ordinarily occur between 7:30 P. M. and midnight.

Recreational traffic which is carried to the outskirts of a city or beyond, usually does not create a serious problem. Such parking demands are so great that they almost invariably require provision for off-street parking facilities.

Ball games and other recreational crowds are accommodated either in special off-street facilities or under special traffic plans adapted to the locality. Some of these plans involve the closing of residential streets for parking.

Commercial Loading and Unloading Facilities

The function of a loading zone is to provide a place at the curb where vehicles—commercial, private, or both, as may be designated—may stop long enough to take on or discharge merchandise or passengers.

Inadequate Zones Induce Problems—The lack of proper curb loading zones or of off-street loading facilities has caused truck and delivery vehicle drivers to become the most frequent violators of regulations governing standing vehicles. In curb loading and unloading, the habits of truck operators and helpers must not be overlooked. In addition to demanding spaces which are readily accessible to businesses, they will usually insist on the right to back the trucks to the curb, as this often provides an arrangement which makes loading and unloading of commodities easiest. This should be kept in mind in planning and laying out loading zones as well as in the writing and enforcement of curb regulations. Double parking by commercial vehicles has become a very serious problem in many places. It is often the major cause of delays to moving traffic.

It has been pointed out previously that the whole urban pattern of development has been shaped to a considerable degree by the transportation system. The transportation system must provide not only for the movement of great numbers of persons, but for the interchange of tons of merchandise. Both the "raw materials" and the "products" of the central business district are transported

over the streets, and are loaded and unloaded at the spot nearest the destination—frequently the curb.

Commercial Traffic Essential—There are today 45 per cent more motor trucks on the streets and highways than there were ten years ago. Furthermore, there are about 54,000 communities in the United States which depend solely upon trucks for freight service.[14]

Practically 100 per cent of all deliveries within cities are made by trucks. A large percentage of the food products coming into cities from outside are transported by truck. In twelve of the largest cities throughout the country, 40 per cent of the fruits and vegetables arrived by truck in 1938. Figures for smaller cities are not available, but it is certain that the percentage in these would be even greater. All of this indicates that the demand for loading and unloading facilities in the average city is of no small consequence.

Relation of Parking to Registration and Population

The relationships between the parking problem and motor vehicle registrations and population are usually difficult to correlate. There are so many variables that no definite statements can be made as to the parking spaces required in a community, based solely on population and registration.

Travel Habits

The travel habits of people entering congested areas in different sized communities are such that in general the larger the community, and consequently the better the mass transportation facilities, the more people avail themselves of them. It has been found that over 90 per cent of those who enter the business districts of New York City use mass transportation, whereas in communities of 25,000 population having available public facilities, only an average of 20 per cent of those entering the business areas use such facilities. The percentages of people using mass transportation facilities is in direct ratio to the size of the com-

[14] *Motor Truck Facts*, Automobile Manufacturers Association, 1942.

munity, in other words, the larger the community the more people use the public conveyances.

The need for parking facilities in our smaller cities is shown by the fact that 2,320, or 70 per cent of the 3,052 cities ranging in size from 2,500 to over 25,000 and having a total population of 12,607,823 (according to the 1940 census) have no mass transportation facilities.

Travel vs. Population

Table IV shows an inverse relationship between the number of persons per car and the population of various cities. It has been determined that there is one vehicle registered for each four persons in cities of 100,000 to 200,000 population. This average increases steadily to a high average of eight persons per car in cities with over 2,000,000 population.

TABLE IV

Comparison of Population, Registrations, Street Mileages, Persons Per Car and Cars per Mile of Street for the 92 Cities over 100,000 Population—1940 Data

No. of Cities	Population Range	Population	Registrations		People per Car	Miles of Street	Vehicles per Mile of Street
			Cars	Trucks			
49	100,000 - 200,000	132,644	33,104	4,687	4.0	356	106
13	200,000 - 300,000	248,137	61,459	8,103	4.0	651	107
12	300,000 - 400,000	335,521	88,539	11,851	3.8	818	123
4	400,000 - 500,000	463,069	90,081	14,626	5.2	852	122
2	500,000 - 600,000	581,687	132,630	15,356	4.4	746	201
3	600,000 - 700,000	656,429	138,919	19,608	4.7	1,041	162
1	700,000 - 800,000	770,816	88,383	19,369	8.7	704	153
3	800,000 - 900,000	851,161	169,271	23,154	5.2	1,085	177
3	1,000,000 - 2,000,000	1,686,354	393,541	43,981	4.8	3,208	145
2	Over 2,000,00	5,425,902	693,306	94,182	8.0	4,562	86

Table V shows the same relationship in a slightly different manner. It should be noted that the ratio of persons entering the

central business districts of small towns by automobile is very high, but that this ratio decreases more than half from the average of cities under 100,000 population to the average of cities over

TABLE V

TYPICAL COUNTS OF PEOPLE ENTERING CENTRAL DISTRICTS AND MODE OF ENTRY

Eight Typical Cities Under 100,000 Population

	PERCENTAGES ENTERING BY:				
CITY	AUTOS	BUSES	TRUCKS	OTHER MEANS	POPULATION 1940
Glendale, Cal.	86.7	6.7	5.2	1.4	82,582
Hamilton, Ohio	75.5	15.4	7.9	1.2	50,592
Kenosha, Wis.	81.4	9.4	5.2	4.0	48,765
Lincoln, Neb.	81.2	5.0	10.5	3.3	81,984
Midland, Mich.	91.8	0.1	8.1	.....	10,329
New Brunswick, N. J.	73.2	11.9	13.0	1.9	33,180
Saginaw, Mich.	88.3	11.7	.....	.....	82,794
Schenectady, N. Y.	71.0	13.5	11.6	3.9	87,549
Averages	81.2	9.3	7.7	1.8	59,098
Six Typical Cities 100,000 to 500,000 Population					
Houston, Tex.	78.5	15.8	5.7	.....	384,514
Louisville, Ky.	66.5	3.5	12.4	17.6	319,077
Oakland, Cal.	70.0	.....	3.9	26.1	302,163
Portland, Ore.	74.2	.....	.....	25.8	305,394
St. Paul, Minn.	64.8	2.4	8.6	24.2	287,763
Youngstown, Ohio	60.3	.....	7.2	32.5	167,720
Averages	69.1	3.6	6.3	21.0	294,438
Ten Typical Cities over 500,000 Population					
Boston, Mass.	35.6	3.5	6.4	54.5	770,816
Chicago, Ill.	30.3	6.9	3.1	59.7	3,396,808
Cleveland, Ohio	56.8	4.1	5.6	33.5	878,336
Detroit, Mich.	49.2	9.9	1.7	39.2	1,623,452
Los Angeles, Cal.	56.0	.....	.....	44.0	1,504,277
New York, N. Y.	14.2	12.0	4.6	69.2	7,454,995
Philadelphia, Pa.	35.5	4.4	7.2	52.9	1,931,334
Pittsburgh, Pa.	41.9	5.3	8.3	44.5	671,659
San Francisco, Cal.	41.3	.....	6.1	52.6	634,536
St. Louis, Mo.	50.2	12.4	10.2	27.2	816,048
Averages	41.1	5.9	5.3	47.7	1,968,125

500,000 population. These figures were for pre-war travel habits. During the war the percentage of persons entering the central business district by mass carriers increased greatly. Some predict that this condition will prevail in the future, so that in the larger cities private autos may bring into the downtown district only about 10 per cent of the traffic load.

Problem More Acute in Small Towns—From the tables, the conclusion may be drawn that the need for parking facilities in proportion to populations is greater in the smaller cities. However, this is only an *average* indication and no city is safe to take these figures as reference in attacking its own parking problem. Land development, realty values, and other factors, fortunately make it easier in many instances for the smaller cities to meet the needs than the larger cities.

One of the first steps which should be taken by any municipality in solving its traffic problem involves the study of Parking Demand. Explanations of this demand, and methods of measuring the demand will be discussed in the following chapter.

CHAPTER III

CURB PARKING

Demands For Curb Parking

Many arguments are advanced and many demands are made for curb parking. Some are well founded and realistic, others are selfish and unreasonable. The only logical and fair way to deal with the problem is to conduct factual and unbiased studies, basing changes on findings which indicate the greatest benefits to the majority of individuals and agencies involved. As in other traffic matters, comprehensive surveys provide data essential in determining the best types of curb parking and the most reasonable and effective regulations.

Common Arguments

As pointed out in an earlier chapter, almost everyone operating a vehicle on the streets and highways would like to be able to drive directly to their destinations and then park their vehicles at the curb immediately in front of a store, office, home or other point of destination. They prefer a convenient angle at the curb with no restrictive regulations. While to most motorists this is the most convenient of all parking choices, it is obvious that such accommodations cannot always be provided. Demands are too great and the streets have a first responsibility to moving traffic.

Unfortunately, there are many individuals and groups who insist on curb parking privileges which penalize the vast majority of street users. There are merchants who insist that the success of their business depends entirely on the ability of persons to park at the curb in front of their stores. There are city officials who say that people, especially women, just can't park autos parallel to the curb and that they will carefully avoid areas in which this type of parking is enforced. There are professional and "influential" per-

sons who demand special space and parking regulation privileges. There are commercial fleets that would monopolize large portions of curb space in the storage of motor vehicles. Naturally, all groups and individual operators have personal interests and their points of view relative to parking are governed accordingly. It is the responsibility of public officials to weigh and coordinate these to the best advantage of all.

To allow the demands of personal interests to retard the instigation of sound curb parking regulations is a dereliction of duty on the part of public officials. Studies can be made which will show the benefits and detriments to all concerned. Opinions need not control the action.

Evils of Curb Parking

In spite of the many arguments favoring parking vehicles at the curb and the concession that under most circumstances curb parking is most convenient for vehicle users, the fact remains that there are many situations created by curb parking practices which make this type of parking undesirable:

Reduces Street Capacity—One of the most serious objections to curb parking in the downtown area and on heavily traveled streets is that it materially reduces street capacity. Not only do the cars stored at the curb occupy an important portion of street pavement, but vehicles maneuvering into and out of spaces also retard moving traffic.

Uneconomical Use of Space—Such uses of street space are uneconomical. The pavement occupied by parked cars is just as expensive to the city as the pavement used for moving traffic, yet it accommodates only a fraction of the total street users. It is not an efficient or economical method of providing parking facilities.

Penalizes Majority of Street Users—Since only a small percentage of all street users are able to park in any given area, curb parking penalizes a vast majority to convenience a very small minority.

Major Factor in Accidents—Curb parking is always a major contributing factor in accidents. Vehicles entering or leaving a park-

ing space, those improperly parked, and persons entering a roadway from between parked vehicles are serious causes of motor vehicle accidents.

Cost of Commerce Increased—When curb parking is allowed unduly to restrict movement, or create congestion, it thereby has a distinct bearing on the cost of commerce. These costs must ultimately be borne by consumers—the public.

Decentralization—Confusion and accident conditions created by curb parking may actually become so acute as to repel persons from congested areas and thereby induce uncontrolled decentralization which can seriously affect realty and tax values.

Fire Hazards—In a number of instances, curb parking practices have constituted serious fire hazards either through the slowing of emergency vehicles approaching fires or through the undue obstruction of hydrants.

While these are but a few of the evils that are developed by curb parking practices, they serve to illustrate the fact that under many conditions and circumstances, curb parking is not desirable and should not be permitted except with proper regulations and enforcement. With decentralization being made necessary, with marked changes in tax structures, with zoning plans being destroyed, with blighted areas developing and with the assurance that streets and new centers will rapidly become saturated, it is evident that the efficiency of automotive transportation will be threatened if steps are not taken to provide for parking and storage of motor vehicles. Basic street plans cannot be changed over night to provide adequate curb parking as land values and construction costs are too great. Stringent regulations and special off-street facilities can provide the only correctives for the acute problem.

Measuring Parking Demand

Information Obtained—The characteristics of curb parking demands can be measured by engineering surveys.[15] They are usually

[15]Detailed methods for making curb parking studies can be found in *Traffic Engineering Handbook*, Institute of Traffic Engineers and National Conservation Bureau, 1941; and *Manual of Traffic Engineering Studies*, National Conservation Bureau, 1945.

aimed at determining, for a given area,

(a) Total demand for curb space
(b) Fluctuations in the demands at different periods of the day
(c) Durations of parking
(d) Types of vehicles using curb spaces
(e) Concentrations in different areas

The studies might also be extended to ascertain violations of curb parking regulations—both as to time and space. These studies are limited to observations of uses of existing curb parking spaces in particular areas. They do not necessarily involve the determination of the total desires for parking space (curb or otherwise), which can only be ascertained by comprehensive cordon counts, origin and destination surveys, and special parking studies.

Recording Parking Durations—A common method of measuring curb parking demands involves the recording of parking durations in a given area of a city. Simple field sheets are used to record license numbers (the last three digits of each number is usually sufficient) of parked cars on each block by 15 minutes, 30 minutes, or 1 hour periods, fitting the time to the existing time regulations.

The form used in such studies should preferably provide a space for each legal curb parking space, so that empty spaces will be determined as well as the durations of use of spaces. Such studies extended over the entire day will show the total demand, fluctuations, durations, areas of parking concentration, time and space violations, and types of parked vehicles. By recording the entire license number for each vehicle and checking registrations, individual users of parking spaces can be identified. These latter studies may be particularly useful in determining such things as the extent to which employees utilize curb spaces in order to park near their places of work. Also, origins and destinations can be determined by relating the parking areas to residences or addresses of vehicle owners.

A suggested field form for curb parking study is shown in Figure 6 and a suggested code system to be used in marking this sheet is shown on page 32.

SAMPLE FORM

CURB PARKING FIELD SHEET

ON _____ SIDE OF _____ ST. FROM _____ ST.,

TO _____ ST. DATE _____ WEATHER _____

PRESENT PARKING TIME LIMITS _____ RECORDER _____

SKETCH

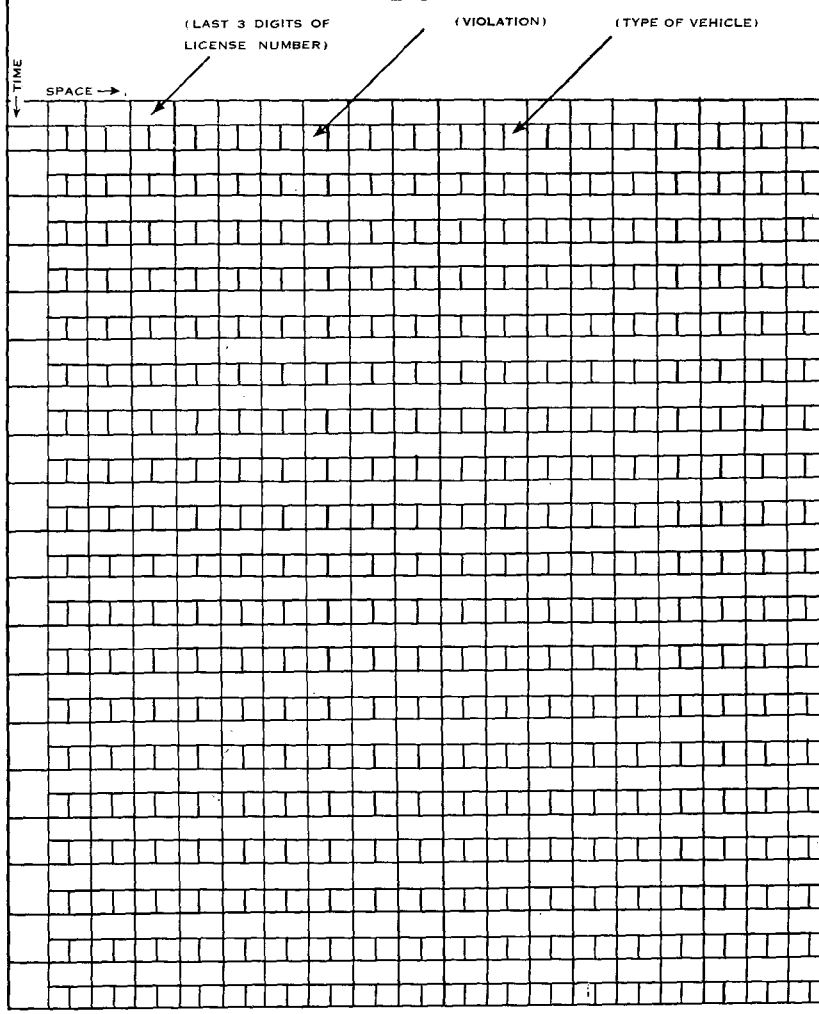


FIGURE 6—Sample Form, Curb Parking Field Sheet

SUGGESTED CODE FOR STREET PARKING STUDY

VIOLATIONS (LOWER LEFT HAND SQUARES ON FIELD SHEET)

A. PARKING METER SHOWS OVERTIME
B. DOUBLE PARKED
C. TOO CLOSE TO CORNER
D. SAFETY ZONE
E. BUS STOP
F. LOADING ZONE
G. DRIVEWAY
H. FIREPLUG
I. THEATER OR OTHER PUBLIC ENTRANCE
J. ON CROSSWALK
K. WRONG SIDE
L. TOO FAR FROM CURB
M. ANGLE PARKED IN PARALLEL STALL
N. NOT PARKED IN MARKED STALL

(NO MARK FOR LEGALLY PARKED)

(TYPE OF VEHICLE LOWER RIGHT HAND SQUARES)

1. LIGHT TRUCK (4 WHEEL)
2. HEAVY TRUCK (6-10 WHEEL)
3. TRUCK-TRAILER COMBINATIONS
4. COMMERCIAL PASSENGER VEHICLE
5. PASSENGER VEHICLE (FOREIGN LICENSE)
6. MISCELLANEOUS VEHICLE

(NO MARK FOR PASSENGER VEHICLE WITH LOCAL LICENSE)

Typical Study—Figure 7 shows the relationship between vehicles parked at the curb and total vehicle hours consumed by one-half hour periods. Note that over 47 per cent of the vehicles parked

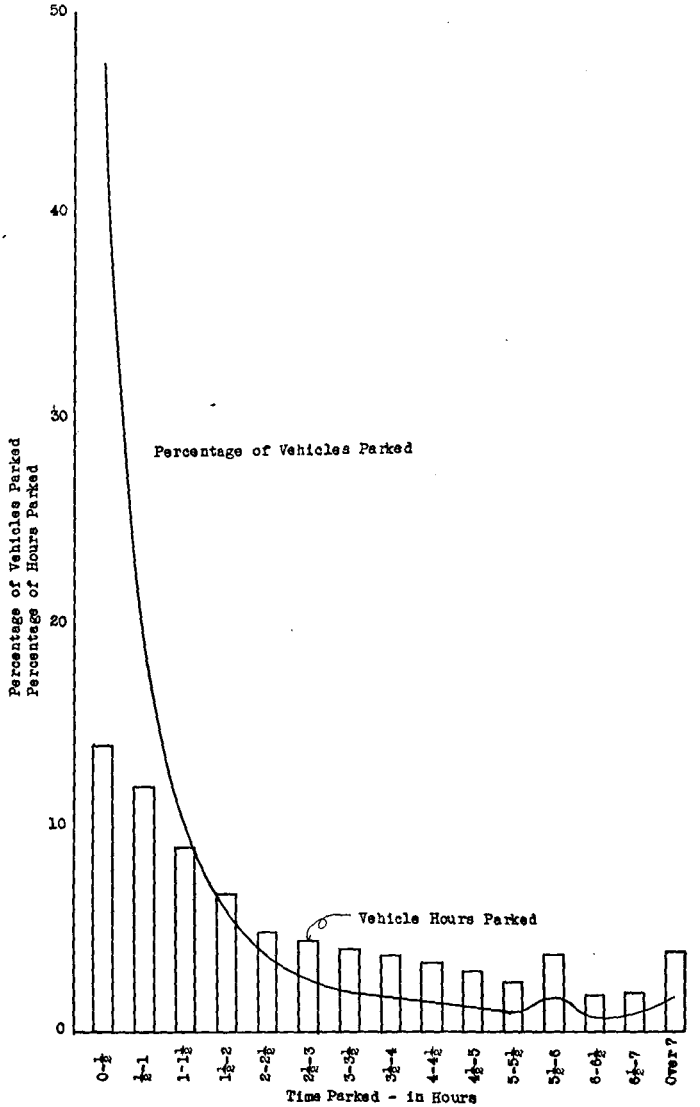


FIGURE 7—Curb Parking Study—Showing Relation between Percentage of Vehicles Parked and Total Vehicle Hours Parked by one-half hour periods

remained for less than one-half hour and only 10 per cent stayed between one hour and one and one-half hours. By adding ordinates, it can be seen that 100 per cent of cars checked used only about 80 per cent of the available space hours.

Demands for parking space by various periods of the day may be determined by the conduct of these studies:

CORDON COUNT—This study involves the tabulation of all vehicles entering and leaving a specific area—usually the central district of a city—for the predetermined period of the study. It is possible to determine the accumulation of vehicles within the cordon by studying the total inbound vehicles and total outbound vehicles for any given period. This accumulation gives an indication of *total* existing or current demand for parking space within the area.

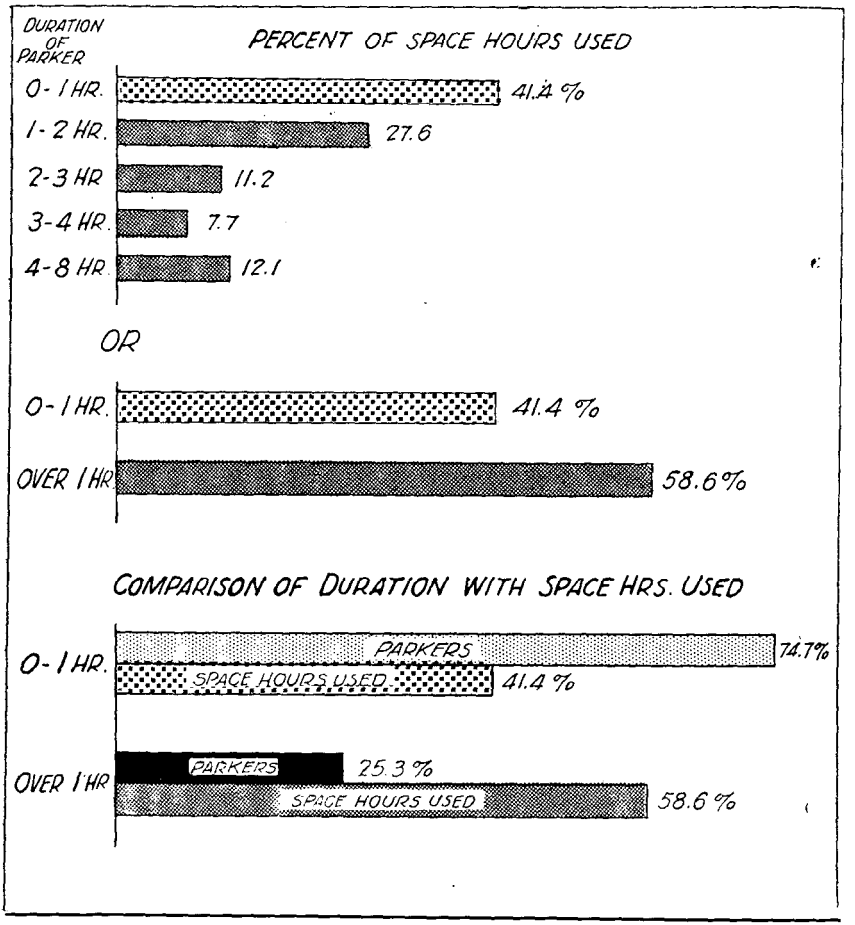
ORIGIN AND DESTINATION—In order to relate demands for parking space to small areas within the central district of a city, studies are made to determine the destination points of persons visiting the district. There are various methods of determining the origin and destination of traffic. Recent studies have employed the technique of interviewing persons in their homes and places of business. Sampling techniques and methods were developed by the U. S. Public Roads Administration. It is possible to obtain a representative sample of traffic and predict from this the actual traffic generated within various sections of the congested area.

CURB INTERVIEWS—Recent studies have been made which involve the questioning of all parkers at the curb and in off-street facilities within a certain section. Volunteer workers have been used effectively to obtain the information through a personal interview at the time the person parks. Origin and destination, as well as curb parking habits and practices can be obtained. The city of Detroit has recently used this system of measuring parking demand by employing Boy Scouts to obtain the information.[16]

Data on the duration and space-hour distribution of curb parkers in Durham, North Carolina, are shown in Figures 8 and 9.[17]

[16]*Downtown Detroit Traffic Survey, Methods and Procedures*, 1944. Traffic Engineering Bureau, Detroit, Michigan.

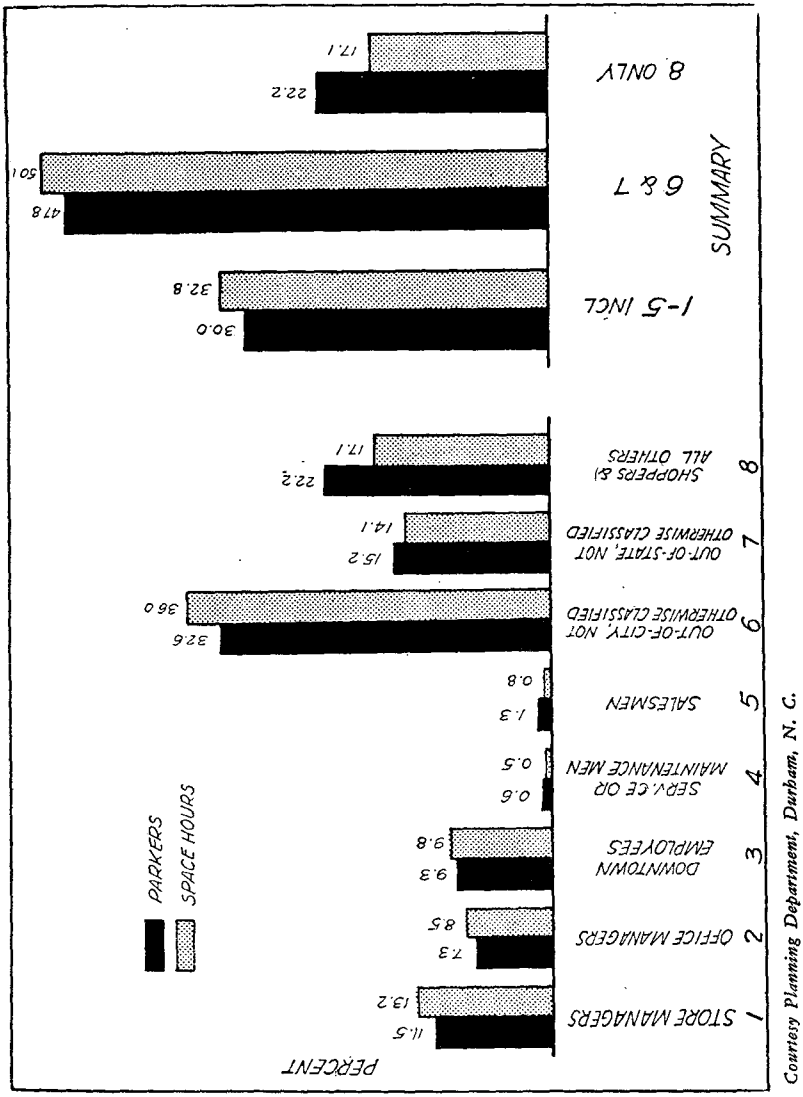
[17]*Parking Survey*, City of Durham, North Carolina, 1945.



1096 SPACE HOURS USED OR 92% OF POSSIBLE MAXIMUM
9:00 A. M. - 5:00 P. M. OCTOBER 24, 1945

Courtesy Planning Department, Durham, N. C.

FIGURE 8—Used Space Hour Distribution of Parking



Courtesy Planning Department, Durham, N. C.

FIGURE 9—Number and Space Hour Distribution of Overtime Parkers

Determining Locations and Capacities—Every city should know the exact locations and capacities of curb facilities available for parking. These are ascertained simply by observations in the field

and by measuring the linear sections of curb space. Spaces are indicated on a map, or street log, along with restricted areas such as fire hydrants, crosswalks, alley entrances, loading zones and taxi zones. Thus, an up-to-date record can be easily maintained as to available curb spaces for parking, showing physical layout and physical restrictions.

Studies of curb facilities should also take into account various parking regulations and legal restrictions. The type of parking (angle, parallel, etc.), time limits, and other controls should be recorded along with the above mentioned data.

Typical Sketch of Curb Layout—A typical sketch showing the physical layout and use of the curb for various sections of street is shown in Figure 10. Note that all physical features are shown, together with the parking regulations in effect at the time of the study. From such a sketch, it is a simple matter to maintain a graphic record of curb facilities for parking, loading, and for restricted zones. Street space for moving traffic is also shown.

Control of Curb Parking

To use streets for the dual purpose of moving traffic and storing vehicles, it is necessary to apply and enforce numerous regulations. To allow the greatest possible use of available curb space for parking, time regulations are imposed; to protect street users and to relieve congestion, curb areas are regulated.

The control of curb parking involves many techniques, policies and activities. Only the most significant are discussed here.

General Parking Regulations

Parking regulations aimed at controlling the use of the curbs for storing vehicles include basic rules established by state codes as well as local rules created by city ordinances. These regulations are enacted either to provide *public safety* or *public convenience.* Proper education of the public as to the necessity for such regulations and the necessity for compliance with them is a major factor in any satisfactory solution of parking problems.

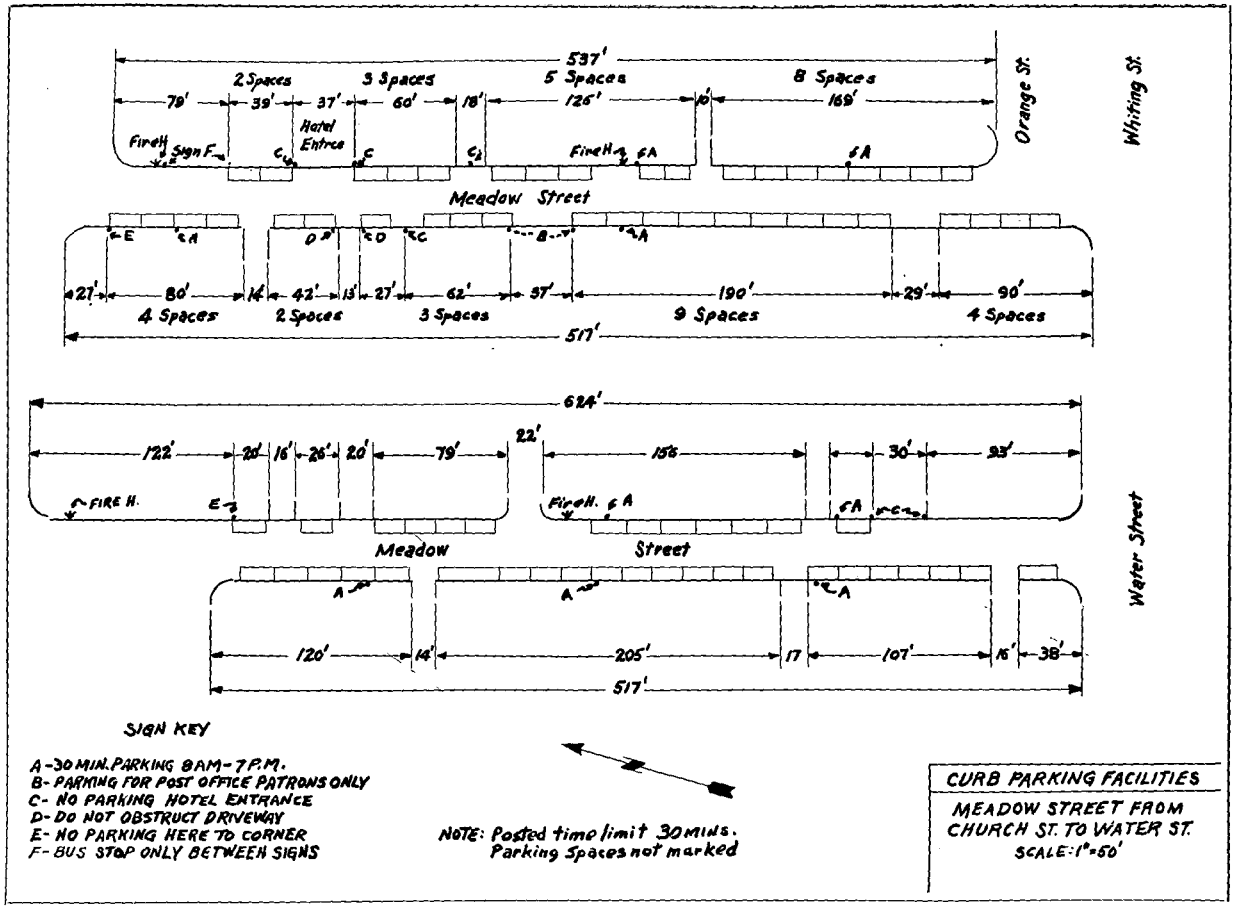


FIGURE 10—Typical Sketch Showing Curb Parking Facilities and Layout

STATE PROHIBITIONS

Uniform Motor Vehicle Code—It is essential that adequate and enforceable laws be enacted relative to the control of curb parking. Parking prohibitions are prescribed in the motor vehicle codes of all states. For uniformity and fairness, it is recommended that every state adopt the basic provisions of Act V of the Uniform Motor Vehicle Code which relate to the stopping, standing and parking of vehicles. These provisions prohibit parking as follows:[18]

1. On a sidewalk.
2. In front of a public or private driveway.
3. Within an intersection.
4. Within 15 feet of a fire hydrant,
5. On a crosswalk.
6. Within 20 feet of a crosswalk at an intersection.
7. Within 30 feet upon the approach to any flashing beacon, stop sign, or traffic-control signal located at the side of a roadway.
8. Between a safety zone and the adjacent curb or within 30 feet of points on the curb immediately opposite the ends of a safety zone, unless the (traffic authority) indicates a different length by signs or markings.
9. Within 50 feet of the nearest rail of a railroad crossing.
10. Within 20 feet of the driveway entrance to any fire station and on the side of a street opposite the entrance to any fire station within 75 feet of said entrance (when properly sign-posted).
11. Alongside or opposite any street excavation or obstruction when stopping, standing, or parking would obstruct traffic.
12. On the roadway side of any vehicle stopped or parked at the edge or curb of a street.
13. Upon any bridge or other elevated structure upon a highway or within a highway tunnel.
14. At any place where official signs prohibit stopping.

The Uniform Code further provides that local authorities may, by ordinance, permit angle parking at the curb of all roadways, except that on state highways, the State Highway Commission must approve all such parking.

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[18] *Act V—Uniform Act Regulating Traffic on Highways*, U. S. Govt. Printing Office, 1945.

Model Traffic Ordinance

As with state codes, it is important that parking ordinances of municipalities be uniform and reasonable. The Model Traffic Ordinance, prepared by the National Conference on Street and Highway Safety is recommended as a guide.[19] In addition to recognizing the prohibitions and regulations of the Uniform Code, this ordinance provides for the regulation of parking as to place, time and other circumstances. In parallel parking, the wheels must be within 18 inches of the curb. Signs or markings must indicate angle parking space. Space must always be provided for moving traffic, even in alleys.

All-night Parking—All-night parking on streets generally is not recommended because of difficulties it imposes in street cleaning, snow removal, and, in some cases, fire protection. All-night parking has also been found inducive to auto thefts. Parking is prohibited for a period of more than 30 minutes between 2:00 A. M. and 5:00 A. M. in the Model Ordinance.

Miscellaneous Control—Parking for the purpose of displaying a vehicle for sale or for washing, greasing, or repairs (except emergency), is not allowed. Wide discretion is allowed the traffic engineer or other city official in prescribing regulations for narrow streets, one-way streets, and hazardous or congested places. Signs must be erected showing where parking is prohibited.

Loading and Unloading—Ordinances should also cover matters of stopping for loading or unloading at the curb. The Model Ordinance provides that passenger and freight loading zones may be established and that when signed they are to be properly used by persons for whom intended. Zones established upon request of merchants or others may be provided by the traffic engineer and a service fee may be charged by the city.

Taxi Stands and Bus Stops—Taxi stands and bus stops should be provided only by authorized city officials. They should be desig-

[19] *Articles XIII and XIV—Model Traffic Ordinances*, U. S. Government Printing Office, 1946.

nated by appropriate signs and should be for the exclusive use of public carriers. Buses and taxicabs are not to park in the business district other than in officially designated areas.

The use of passenger loading zones should be limited to 3 minutes per vehicle, that of freight curb loading zones to 30 minutes.

No Parking—Streets on which parking is prohibited at all times and those on which it is prohibited during certain hours should normally be designated as a part of the ordinance. The time limits for curb parking may be designated generally or they may be prescribed by streets or areas as a part of the ordinance. Appropriate signs are to be erected giving time limits, and special parking prohibitions.

Parking regulations should allow broad powers to proper public officials to control and prohibit parking. Demands for space, special traffic conditions, and many other situations point the need for such authority. It is a difficult, if not a hopeless task to provide by ordinance for all of the situations and conditions of curb parking.

Time Limits

Parking regulations for public convenience must include time limits on curb use by individuals. Such regulations reserve curb spaces in the most needed locations for short-time parkers, as is proper. In establishing these limits, consideration must be given to the type of business transacted in the area, enforcement strength, community parking characteristics, and the viewpoints of motorists and land users.

Parking Durations—As was indicated in the discussion of parking characteristics, the majority of the motorists do not care to stay in downtown districts more than an hour and the modal requirement is 30 minutes. Shoppers, alone, may stay two hours or longer, if allowed. Because of these characteristics, the usual parking durations are one hour or one-half hour in business districts, except at those places where short time parking only, usually 15 minutes or less, is allowed. In outlying districts of the city, parking periods

of two hours are common—aimed principally at preventing the use of the curb for long time storage of vehicles as well as to control all night parking.

Enforcement of Curb Parking

The enforcement of curb parking regulations constitutes a large part of the traffic responsibilities of the traffic enforcement agency in every city. Large manpower and equipment requirements are necessary to enforce space and time regulations. However, effective enforcement pays big dividends in terms of curb capacity and orderly traffic flow. It has been estimated on the basis of a recent check made in Morristown, New Jersey,[12] that curb parking capacity on all streets could be increased 14 per cent merely by enforcing the existing one hour limit.

Many methods of enforcing such regulations have been developed, but in most cities the police are usually in the difficult position of attempting to enforce regulations which are contrary to public desires. Enforcement of curb parking regulations is not only one of the largest jobs of city police, but one of the most unpopular. This, again, can be corrected by education of the public.

Foot Patrol

In many cities, the police patrol on foot the principal streets on which parking is a problem, to ascertain violations of time regulations and violations of space regulations. In others, men on foot are used to "spot check" parking throughout the city. While these methods are inducive to a thorough job, they are inefficient from a standpoint of utilization of manpower and require many officers to cover an appreciable area of the business district.

Motor Patrol

Three-Wheel Motorcycles—Enforcement administrators have found that the use of three-wheeled motocycles greatly increases the area that can be effectively covered with a given manpower. This is true whether the patrol is primarily for enforcing parking

[12] *Traffic Survey—Report and Recommendations,* Morristown, N. J., 1946. National Conservation Bureau.

prohibitions or for checking time violations—with or without parking meters.

Motorcycles with Side Cars—On heavy traffic streets, some cities have used motorcycles with side cars to patrol for parking violations. This offers the advantage of two men—one to operate the motorcycle and the other to observe parking and to mark parked cars. On the negative side is the fact that more manpower is required, and the motorcycles with sidecars are not as maneuverable as the three-wheel motors. Several cities have recently announced the use of small motor-scooters in law enforcement of parking regulations. Greater maneuverability and low expense are the arguments in favor of these vehicles.

Mounted Police

In several large cities, police on horses are employed to enforce curb parking regulations. The principal advantages of this method come from the elevation of the officer so that he is able to observe vehicles for several blocks in each direction. In this way, such violations as double parking and illegal use of curb spaces can be easily detected. Horses also offer advantages in pedestrian control and in policing for special events, where maneuverability is desired by the police. The use of horses in traffic work (parking included) is usually limited to the largest cities where they can be effectively applied in many police functions.

Towing and Impounding Parked Cars

In the enforcement of curb parking regulations, it is the practice in some cities to tow from the streets vehicles which are parked in prohibited zones. Such action may be necessary to carry out the responsibilities assigned to the police. As a general rule, however, the authority to impound vehicles is used with leniency and is fitted to specific offenses. The police fully recognize the distasteful nature of the practice, but on the other hand there is a certain element of the public to which no lesser measures are effective.

Model Traffic Ordinance—The Model Traffic Ordinance recommends the following regulations relative to the removal and im-

pounding of vehicles:[19]

Sec. 166–Authority to impound vehicles–(a) Members of the police department are hereby authorized to remove a vehicle from a street or highway to the nearest garage or other place of safety, or to a garage designated or maintained by the police department, or otherwise maintained by this city under the circumstances hereinafter enumerated:

(1) When any vehicle is left unattended upon any bridge, viaduct, or causeway, or in any tube or tunnel where such vehicle constitutes an obstruction to traffic.

(2) When a vehicle upon a highway is so disabled as to constitute an obstruction to traffic and the person or persons in charge of the vehicle are by reason of physical injury incapacitated to such an extent as to be unable to provide for its custody or removal.

(3) When any vehicle is left unattended upon a street and is so parked illegally as to constitute a definite hazard or obstruction to the normal movement of traffic.

(b) Whenever an officer removes a vehicle from a street as authorized in this section and the officer knows or is able to ascertain from the registration records in the vehicle the name and address of the owner thereof, such officer shall immediately give or cause to be given notice in writing to such owner of the fact of such removal and the reasons therefor and of the place to which such vehicle has been removed. In the event any such vehicle is stored in a public garage, a copy of such notice shall be given to the proprietor of such garage.

(c) Whenever an officer removes a vehicle from a street under this section and does not know and is not able to ascertain the names of the owner, or for any other reason is unable to give the notice to the owner as hereinbefore provided, and in the event the vehicle is not returned to the owner within a period of three (3) days then and in that event the officer shall immediately send or cause to be sent written report of such removal by mail to the State Department whose duty it is to register motor vehicles, and shall file a copy of such notice with the proprietor of any public garage in which the vehicle may be stored. Such notice shall include a complete description of the vehicle, the date, time and place from which removed, the reasons for such removal, and name of the garage or place where the vehicle is stored.

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[19]*Model Traffic Ordinance*–U. S. Government Printing Office, 1946. Sec. 166.

Ill-Will Developed—While most city traffic ordinances provide the police with proper authority to remove illegally parked cars, some Police Departments refrain whenever possible from carrying out the practice, because of the ill-will it develops from the motoring public. Towing and storage charges are added to fines so that sizeable penalties are usually imposed. Tires, glass, brakes or other parts of the vehicle may be damaged in the process of towing. Where violations are flagrant, however, especially the practice of leaving vehicles in busy areas where parking is prohibited, the police may be forced to resort to the use of this authority to cope effectively with the problem and to keep streets open for moving traffic.

Parking Meters

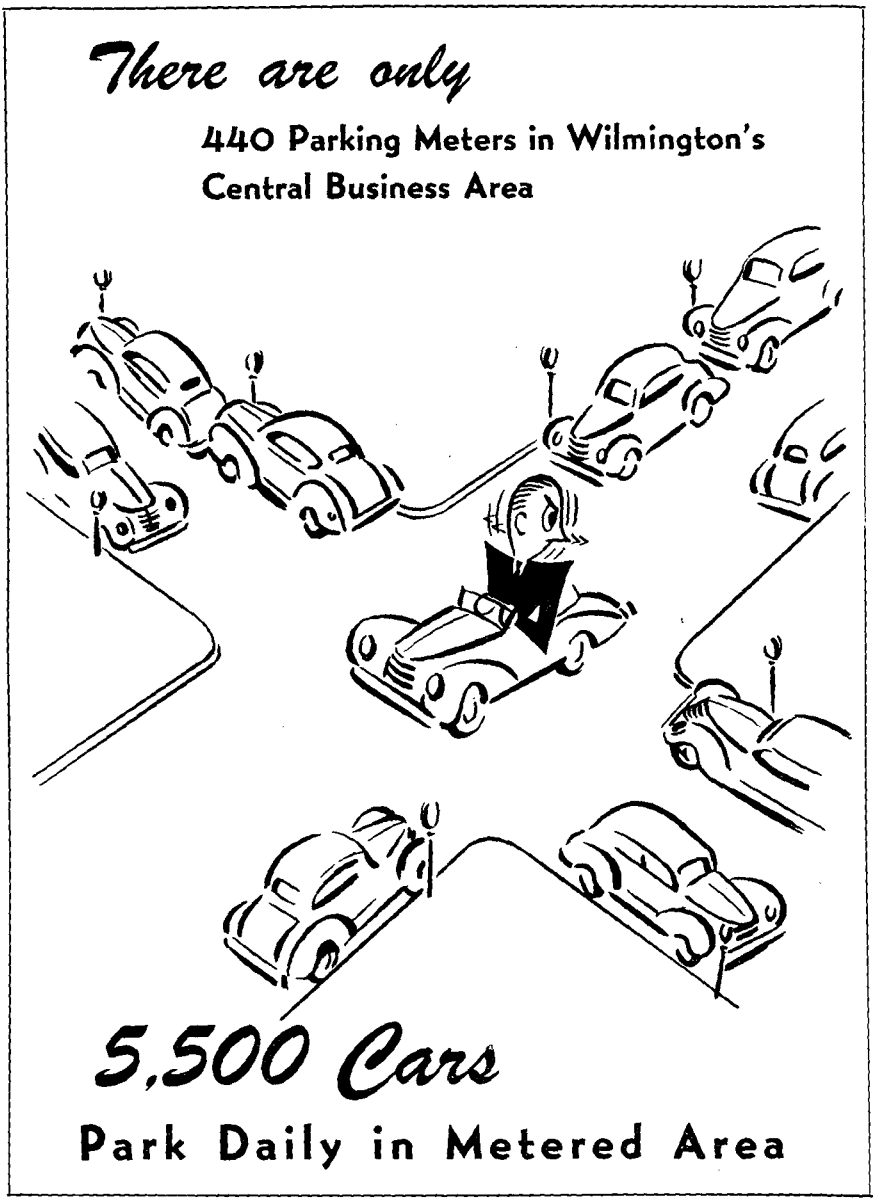
One of the newest means for controlling curb parking is the parking meter. It was not generally applied until the late thirties, yet in a short space of time meters were widely accepted and used. Many controversies have arisen concerning the use of this device. Court cases have arisen in practically every state. Some installations have been readily accepted by public officials, others have not. Motorists have rebelled against the use of meters in some cities, while in others they have, as a body, demanded their installation.

Parking meters cannot bring into use any additional curb space for parking. Some cities, in their endeavor to increase revenue, have made the mistake of adding additional parking stalls near intersections and prohibited parking zones when meters were installed. Such practices should be avoided as they induce accidents and public resentment to meters.

Meters do provide curb parking for a greater number by creating a much greater turnover in curb use. Therein lies their chief benefit.

Figure 11 shows the effect of parking meters on curb use in Wilmington, Delaware.[20] It can be seen from this illustration that

[20] *What About the Parking Situation in Wilmington's Business Center;* Committee on Parking, Chamber of Commerce, Delaware, Inc.



From the Report: "What About the Parking Situation in Wilmington's Business Center," Committee on Parking, Chamber of Commerce, Delaware, Inc.

FIGURE 11—Effect of Parking Meters on Parking Turnover

there is an average turnover of 12.5 vehicles for each curb space in the metered area of the city.

Legality of Meters Questioned—Because of the many questions which have been raised in cities in which meters were proposed or were installed, a number of court cases have arisen. In several instances, cases were carried to the higher courts. Except in very few cases, the courts have always held parking meters legal as an aid to the enforcement of curb parking regulations. It was the opinion of the courts that as enforcement devices which would aid the local police they were allowable.

Meters are now so generally used and accepted that questions of their legality are few. The question seems to have been settled in a sufficient number of cases to establish a legal pattern permitting the use of meters generally throughout the country.

Types of Meters Vary Widely—In the early days of parking meters, many patents were issued and many types of mechanical timing devices were manufactured and offered for sale as parking meters. Sensing the large potential of these devices, keen competition developed between the various manufacturers and their distributors. So keen was this competition and the resultant sales efforts, that a number of public officials became biased against the purchase of meters. Soon after the first "splurge" of meter sales, this condition receded and now, while the competition is still keen, meter sales are on a sound basis.

One of the most difficult manufacturing problems in parking meters has arisen from attempts of motorists and others to "beat the meter." Various means were employed to actuate the early types of meters without the deposit of coins. Slugs, heavy blows, soda straws and other devices and techniques were used to actuate the meters without the deposit of legal tender. Another problem arose in the collection of meter income.

In modern meters, manufacturers have been able to overcome most of these difficulties. Inventions have made it almost impossible to "beat" the meters and, with most types of meters, collections have been insured by such means as interchangeable sealed coin compartments, double lock collection chambers, installation

of coin counters, etc. Miami, Florida, uses Armored Car Services to collect meter revenues at night, thus making police available for other duties.

Single-coin parking meters take only one coin at a time, whether five cent coins or pennies. The earlier installations were nearly all of this type. This type of meter does not allow the motorist to pay in proportion to the amount of time he wishes to park. The fifteen minute parker must pay the same fee as the one hour parker.

Multiple-coin machines take one or more coins of a single kind and allow parking for variable periods depending on the number of coins inserted. For example, some machines permit twelve minute parking for one cent and additional parking time for additional pennies up to a predetermined limit.

The combination meter permits the use of either pennies or five cent coins. It will, for example, take one or several pennies for varying parts of an hour, or a five cent coin for a full hour's parking.

Experience In Meter Use—In most cities, experience would indicate that the desirable method for installing meters is that of first putting a small number in shopping or business areas where traffic conditions are most congested. In this way the citizens and merchants have ample opportunity to observe the operation of the meters, to "try them out" and thereby decide for themselves whether or not they appear to be an acceptable device for improving curb parking conditions in the city. Again, experience has shown that when this method is applied, meters are invariably accepted by the public, by property owners, and by merchants alike, so that it is usually only a short time before additional numbers are being requested or demanded. In cases where large numbers of meters have been installed as a first installation in the city, it has been found that criticisms and objections have been raised and that while they can usually be overcome, the time lag may be appreciable and the advantages of meters mav be offset for several months because of public resistance.

The utility of meters seems to stem partially from the fact that the American public is mechanical minded. Most persons in the

United States will pay attention to a mechanical device. This, of course, has been proven in traffic in a number of instances, notably the stop and go traffic signals. Because the motoring public is mechanical, or gadget minded, the meters induce a very high rate of voluntary observance. It is in this way that they afford a real aid to the enforcement of parking regulations. Contrary to the belief of many, they do not appreciably aid the police insofar as the manpower and equipment requirements are concerned for enforcing parking regulations. Most motorists try to avoid having a red flag or other violation indication in front of the space in which their car is stored. In order to prevent this, better observance habits are developed.

Miami Beach, Florida, has developed a new method of using parking meters on city-operated parking lots instead of paying attendants, thus allowing parking maintenance expenses to vary automatically with seasonal population changes.[21] Meter fees are graduated according to location. In one large lot now operating, parkers in the rows nearest the stores pay five cents for 60 minutes, while the same fee buys 90 minutes' parking time in slightly less convenient locations. Twenty-five cents provides all day parking in some places.

The meter plan is supplemented by parking permits. During the tourist season, monthly parking tickets for lots only may be purchased for $3.00 per month. The fee for the remainder of the year is an additional $3.00.

Cities Using Meters—As shown in Table VI, most of the installations of parking meters by 1945 had taken place in cities with populations over 10,000. Smaller cities, whose parking problems are not so acute, had not installed many meters. Two-thirds of the cities with populations between 100,000 and 500,000, and over 40 per cent of cities with populations between 25,000 and 100,000 had meters operating.[22]

[21]*News Bulletin*, June 22, 1946, Public Administration Clearing House.

[22]*Parking Meters, Their Use for Traffic Control and Revenue*, Municipal Finance Officers Association, March 1946.

TABLE VI

PARKING METERS BY SIZE OF MUNICIPALITY—1945

POPULATION GROUP	TOTAL NUMBER OF MUNICIPALITIES IN THE UNITED STATES	NUMBER OF METERED MUNICIPALITIES	PER CENT OF MUNICIPALITIES METERED
Over 500,000	14	4	29%
250,000 to 500,000	23	14	61%
100,000 to 250,000	55	37	67%
50,000 to 100,000	107	47	44%
25,000 to 50,000	213	95	45%
10,000 to 25,000	665	147	22%
Under 10,000	15,675	129	1%
		473	

Source: Vehicular Parking, Ltd., Newark, N. J.

Income From Meters—Meters have an excellent record as revenue producers in addition to their use as traffic control aids. Table VIII shows that in 1944, 150,414 meters in 323 cities took in $9,383,907 —an average of $62.38 per meter. This average includes meters in operation only a part of the year, as well as meters in poor locations which were not economically successful. Considering valid meters only, income can be estimated at about $6.00 per month, or $75.00 per year.

Table VII gives illustrations of actual meter revenue in seven cities.

TABLE VII

PARKING METER REVENUES FOR SELECTED CITIES—1944

CITY	POPULATION	NO. OF METERS	1944 GROSS REVENUE
Cleveland	878,336	3,616	$251,354
Buffalo	575,901	1,000	75,390
Minneapolis	492,370	1,500	146,609
Oklahoma City	204,424	992	86,754
Corpus Christi, Texas	57,301	625	52,873
Wilmington, N. C.	33,407	500	46,473
Brownsville, Texas	8,105	215	8,012

Source: Vehicular Parking, Ltd., Newark, N. J.

TABLE VIII

GEOGRAPHICAL GROUPING OF CITIES WHICH HAVE INSTALLED PARKING METERS, TOGETHER WITH THE NUMBER OF METERS AND 1944 RECEIPTS

STATE	NO. OF CITIES	NO. OF METERS	NO. OF CITIES NOT REPORTING RECEIPTS	NO. OF METERS IN CITIES NOT REPORTING RECEIPTS	REPORTED RECEIPTS 1944
Alabama	1	60			$ 6,578
Arizona	1	900			63,809
Arkansas	3	1,475	2	850	40,117
California	9	8,152	3	1,150	531,282
Colorado	1	3,000			215,185
Connecticut	11	8,396	4	3,063	189,944
Delaware	1	420			40,000
Florida	8	4,243	2	165	294,862
Georgia	2	1,198			87,747
Idaho	4	1,221	1	577	37,830
Illinois	17	5,389	11	2,675	191,405
Indiana	9	3,486	2	358	216,465
Kansas	5	1,009			45,931
Kentucky	5	1,654	2	412	44,836
Louisiana	1	950	1	950	.....
Maryland	10	1,540	6	875	47,502
Massachusetts	1	165			14,739
Michigan	13	6,040	1	460	414,535
Minnesota	3	2,068	2	655	146,608
Mississippi	2	971			57,548
Missouri	10	3,655	3	1,319	125,181
Nebraska	4	2,472			148,752
New Jersey	17	10,408	6	3,139	293,930
New York	43	20,631	9	2,241	755,893
North Carolina	3	1,159			108,402
North Dakota	1	495			22,077
Ohio	37	19,079	10	2,096	1,222,088
Oklahoma	11	3,871	4	1,339	201,743
Oregon	3	2,760			265,294
Pennsylvania	84	22,862	21	5,647	894,808
South Carolina	3	1,021			70,261
Tennessee	8	4,429			260,164
Texas	27	19,493	9	4,213	1,022,352
Utah	3	2,939			205,533
Virginia	23	4,486	4	1,065	256,475
Washington	13	8,127	2	593	632,073
West Virginia	27	5,945	21	4,722	37,356
Wisconsin	3	1,645			85,463
Wyoming	2	873	—	—	60,525
TOTAL 39 States	429	188,687			$9,355,293
Washington, D. C.	1	289			28,614
TOTAL	430	188,976	107	38,562	$9,383,907

Information as of January 1945. Source: Vehicular Parking, Ltd., Newark, N. J.

Most ordinances authorizing the installation of meters provide that the revenue will be used for the improvement of traffic conditions of the city. Profits are earmarked for traffic enforcement, traffic engineering, off-street parking facilities, or other improvements. Public officials must not be so short-sighted as to reduce the normal budgets of the agencies receiving the meter revenue. In some cases, budgets were reduced by about the amount the meters would produce, thus, in effect, marking the meter revenue for the general fund of the city rather than for traffic improvement as basically intended. Motorists and the general public are fully justified in openly resenting all efforts to divert funds from parking meters to uses other than the improvement of traffic conditions.

Parking Fines

The amount of penalties for parking violations is a legal matter that must be fixed by the legislative bodies and courts of each political jurisdiction. The general practice is to keep fines for common parking violations low. Since public safety is not affected directly by overtime parking, it is logical to assess moderate fines in such cases. Double parking, parking in prohibited areas, and similar offenses might create a hazard to other street users, so larger fines or more severe penalties are recommended in these cases.

Curb spaces are usually so scarce that motorists are prone to take chances with the violation of parking regulations. In some instances, the fine is considered cheaper than a parking fee in a garage. Then, there is always the chance that the violation will not be detected. Many cities attempt to overcome these two practices by assessing higher fines and collateral schedules for initial violations. As pointed out elsewhere in this report, it is not considered advisable to fix initial fines and collaterals for parking violations too high because of the court congestion which will develop and because of the public resentment which will be created in connection with general traffic enforcement work. On the other hand, the penalty must be sufficiently severe to discourage wanton violations. Some instances are known where fines for time violations are always fifty cents, and with some drivers it is habitual practice to purposely violate regulations on the basis of cheap purchase of convenient storage space.

Cafeteria Courts—Such courts may be used to avoid court congestion and to convenience motorists. Most cities establish collateral schedules covering the more common types of parking violations and permit offenders to deposit cash bond in accordance with the accused violation in the "cafeteria" courts, or with other duly authorized agencies of the courts. In developing these schedules of penalties, care should be taken to fit the fines to the seriousness of the offenses. Where penalties are out of keeping with the relative seriousness of offenses, police officers are often induced to assume functions of the courts by making charges which do not fit the particular parking violation, simply because they feel that the collateral schedule is more reasonable for the charge made. One such instance involves a case in which police officers considered the collateral required for "double parking" too high in relation to other penalties for parking violations. As a result, they often charge double parkers with "parking more than ..... inches from the curb" rather than for the double parking violation of which they are guilty.

Types of Curb Use

The conventional types of curb parking are "angle parking" and "parallel parking." Most regulations provide that all parking should be parallel unless angle or other types are specifically designated by signs or markings. The advantages and disadvantages of each type, as well as of several less common types, should be studied before deciding on the character of parking to be allowed on a particular street. In extreme cases, it might be found necessary to prohibit parking at the curb.

Prohibited Parking

As has been pointed out in previous sections, it may be necessary under certain conditions to prohibit parking from one or both sides of certain streets, either to provide public safety or for public convenience.

Public safety requirements were set forth on page 39. For public convenience it is necessary to prohibit parking so as to expedite

traffic flow. This may either require prohibitions at all times or only during hours of peak traffic flow. In either case, it is essential that the prohibitions be properly posted with standard signs, and enforced.

Of equal, if not greater, importance is the need for basing prohibitions on factual surveys and studies. The responsibility for these studies and for the decisions on regulations should be placed in the hands of competent officials of the city. They must necessarily be given broad powers, even though the proper application of these powers may not be based, at all times, as it should be, on traffic and accident facts.

Parking prohibitions require special ordinances in some cities while in others they are possible under general police powers. Locations should be carefully determined from studies of traffic flow diagrams, load curves, and other traffic facts. Rush hour prohibitions should not be enforced for longer periods than necessary. Enforcement strength should also be considered as "no parking" restrictions require considerable enforcement effort for success.

Prohibiting parking during rush hours invariably reduces accidents. An interesting study is reported for an important artery in Washington, D. C. The street is sixty feet wide and is occupied by a heavily used street car line. Parking was prohibited on one side from 7:00 to 9:30 A. M. and on the other side from 4:00 to 6:00 P. M. After three months, a 70 per cent reduction was noted in accidents, with a marked increase in speeds and traffic volume.

One of the first notable examples of parking prohibition was in the Loop District of Chicago where parking was prohibited only after careful surveys had been conducted and much opposition from the merchants had been overcome. After adequate trial, all parties concerned agreed that it was a desirable regulation and a progressive step for the downtown district of the city. Experiences in this case do definitely show the need for professional surveys on which to base legitimate and workable recommendations for the effective control of parking. These studies should be aimed especially at indicating the amount of retail business created by

curb parking. Usually the volume is much lower than estimated by special interests.

Because loading and unloading operations must be generally permitted to provide property owners their normal access, the lanes nearest the curbs are usually only partially efficient for moving traffic even where curb parking is prohibited. In many instances, the difficulty is accentuated because of unreasonable claims to loading and unloading privileges by certain businesses. Some garages and others even insist on using space at the curb for temporary storage of vehicles which they have received for repairs or services. These difficulties should be recognized in connection with the prohibition of curb parking as they accentuate the need for strict enforcement of the regulations. Otherwise the facility of movement on the street may not be noticeably improved when parking is prohibited.

Buffalo is another large city which prohibits parking in retail areas. New York City has recently enacted parking prohibitions for many of the streets in downtown Manhattan on which curb parking was formerly allowed. In Memphis, Tennessee, parking is prohibited in most congested areas and parking is provided only on one side of the street in others. New Orleans, Louisiana, is another city which permits parking on one side of the street only.[23]

A number of cities have resorted to one-way streets largely as a means of increasing traffic capacity in order to alleviate the necessity for rigid parking prohibitions.

Angle Parking

More Vehicles Accommodated—This type of parking accommodates more vehicles per unit of curb space than does parallel parking, except where the angles are very small. Table IX shows the number of vehicles which may be parked in a 100 foot section by using various parking angles.

[23]*Survey of Traffic Conditions in Twenty-Four of the Nations Largest Cities*, by the Commerce and Industry Association of New York, Incorporated, December 1, 1945.

TABLE IX

PARKING SPACES PER 100 FEET OF CURB BY VARIOUS PARKING ANGLES

ANGLE	SPACES PER 100 FEET	STALL DEPTH (FEET)	TOTAL ROAD SPACE (INCLUDES MANEUVERING)
90°	12	17	40
75°	12	17	36
60°	11	17	32
55°	10	16	29
50°	9	16	27
45°	9	16	25
40°	8	15	24
35°	7	14	23
30°	6	13	22
25°	4	12	21
20°	4	11	20
Parallel	5	8	15

Moving Traffic Penalized—The increased accommodation of parked vehicles by angle parking is obtained at the expense of moving traffic, for a typical 56 foot roadway arranged for angle parking leaves space for only two lanes of moving traffic, whereas the same roadway arranged for parallel parking provides four lanes of moving traffic. In other words, a slight decrease in parking accommodations can result in as much as a 50 per cent increase in street capacity.

The increased capacity of angle parking over parallel is not so great as might seem at first, because of the curb wastage which is developed where it is necessary to break angle parking. This breaking occurs at loading zones, fire hydrants, ends of blocks, and other places where parking is prohibited.

The primary advantage claimed for angle parking is the ease and facility with which a vehicle may be parked. Whereas parallel parking requires a backing maneuver which delays moving traffic, the driver is able to move into an angle stall with no lost motion and a minimum of interference with moving traffic. As has been mentioned previously, many persons contend that some drivers experience much difficulty in parking a car parallel to the curb.

Disadvantages of Angle Parking—While angle parking offers a minimum of interference to moving traffic during the act of parking, this advantage is largely nullified in the act of unparking. Due to lack of visibility, which all concerned will admit is a built-in feature of practically every modern automobile, the act of unparking or leaving an angle stall is much more hazardous than leaving a stall parallel to the curb. The hazard of backing from angle parking stalls is further increased by the practice of many drivers in backing exessive distances. Many seem not to realize the minimum needs for clearing vehicles in front of theirs and unduly delay moving traffic by backing several car lengths more than is necessary to complete the unparking maneuver.

In attempting to overcome this relative blindness when unparking from an angle stall, the driver attempts to ease his vehicle backward to such a position that he can see. This causes moving traffic to swing around the parked vehicle and in many instances has been the cause for head-on accidents with vehicles traveling in the other direction.

Some studies of parking accidents reveal involvement of a large number of vehicles making U-turns in order to occupy angle parking spaces across the roadway. This practice is, of course, discouraged by parallel parking when such U-turns would not be a convenient means of getting a parking space at the expense of cutting across other traffic to the other side of the street. This hazard is well demonstrated in Figure 2.

When cars are parked at an angle, a portion of the front bumper overhangs the curb, causing a loss of sidewalk space. This is not too objectionable, for pedestrians do not generally use the area near the curb due to utility poles, trash boxes, etc., but when the sidewalk is crowded, persons are forced to walk in this area and many painful and sometimes serious accidents are caused by persons unsuspectingly walking into the overhanging bumper of a parked car. On many business streets congestion of pedestrians is as important as the congestion of vehicles. Sidewalks are often as inadequate in meeting pedestrian requirements as are the streets in meeting requirements for vehicles. When angle parking inter-

feres with the normal flow of persons on the sidewalk this congestion difficulty is increased.

Another evil of curb parking is the congestion it creates which is best shown by studies of vehicle speeds. One example of the way in which the elimination of angle parking has improved speed is shown in a report made on Roosevelt Road in Chicago in 1939. Table X, taken from this report, shows the increase in speeds of street cars before and after the elimination of angle parking during the afternoon rush hour.[24]

Another excellent illustration of the effect on moving traffic created by angle parking is shown in Figure 12, Plate, 1. This

TABLE X

STREET CAR SPEEDS ON ROOSEVELT ROAD–BLUE ISLAND AVENUE TO JEFFERSON STREET BEFORE AND AFTER ELIMINATION OF ANGLE PARKING[24]

15 MINUTE PERIOD ENDING	NUMBER OF CARS				AVERAGE MILES PER HOUR					
	EAST-BOUND		WEST-BOUND		EASTBOUND			WESTBOUND		
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	% INC.	BEFORE	AFTER	% INC.
4:15 P. M.	6	3*	3*	5	11.3	10.0	−11.5	10.0	11.6	16.0
4:30	8	8	5	4	10.6	11.3	6.6	8.7	9.0	3.4
4:45	8	8	6	6	9.2	12.5	35.9	10.0	10.0	0.0
5:00	7	8	8	6	10.9	14.0	28.5	9.2	8.5	−7.6
5:15	6	6	7	7	9.7	11.3	16.5	8.5	9.2	8.2
5:30	6	6	7	7	9.4	11.6	23.4	8.5	9.4	10.6
5:45	4	5	7	7	11.6	10.9	−6.0	9.4	9.7	3.2
6:00	5	5	6	5	13.4	14.0	4.5	9.4	9.4	0.0
Total	50	49	49	47						
Weighted Average					10.72	12.05	*12.4*	9.25	9.60	*3.8*

*Incomplete period.

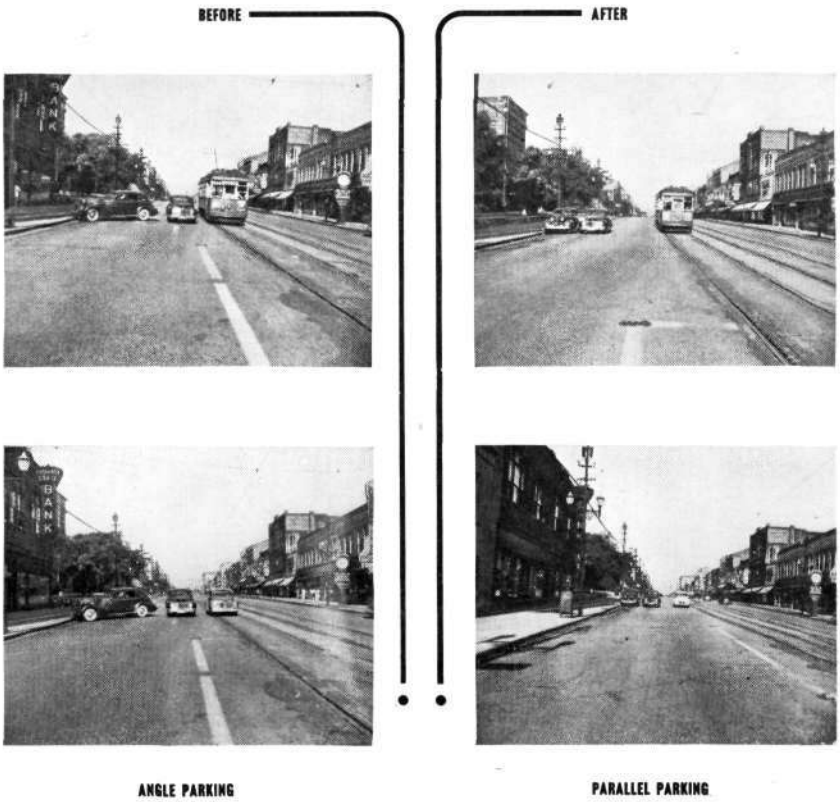
Note: "Before" observations were made on Wednesday, August 16, 1939. "After" observations were made on Tuesday and Wednesday, November 7 and 8, 1939. Range in running time in both directions has been reduced by 25 per cent, indicating fewer interruptions to service.

[24] *Effect of Roosevelt Road Parking Practices on Public Convenience and Safety*, Chicago Surface Lines, September 1939.

Plate 1

Courtesy City of Kansas City, Kansas. Plate 2

FIGURE 12—Comparison of Angle and Parallel Parking



Courtesy Federal Bureau of Investigation

FIGURE 13—Comparison of Angle and Parallel Parking

picture was taken in Kansas City, Kansas, on a main artery when angle parking was permitted. Note that moving traffic was forced into line behind the street car. Plate 2 shows the same location when parking had been changed to parallel. It can be observed that there is ample room for moving traffic to pass between parked vehicles and street cars.

The effect of angle parking on accidents is well demonstrated in a study made by William R. McConochie of the Chicago Surface Lines for a two block section on an important street. Finding that most of the accidents involved parking or parked vehicles, a plan

was worked out to change a portion of the parking from angle to parallel and to reduce most of the 60° angle parking to 30°. A one-year "before' 'and "after" study showed an accident reduction of 60 per cent.[25]

Another study of accidents involving parked vehicles showed vehicles angle parked to be involved in about three times as many accidents in leaving parking spaces as vehicles parked parallel to the roadway.

Figure 14 presents a comparison of curb space and street space occupied for various angles of curb parking. The stalls for angle parking may be as narrow as eight feet although the trend in design of automobile bodies with wide doors has had a tendency to increase this width to a desirable minimum of ten feet.

Factors which control the use of angle parking are:

1. Street width.
2. Traffic density.
3. Vehicle types.
4. Curb capacity.
5. Accidents.

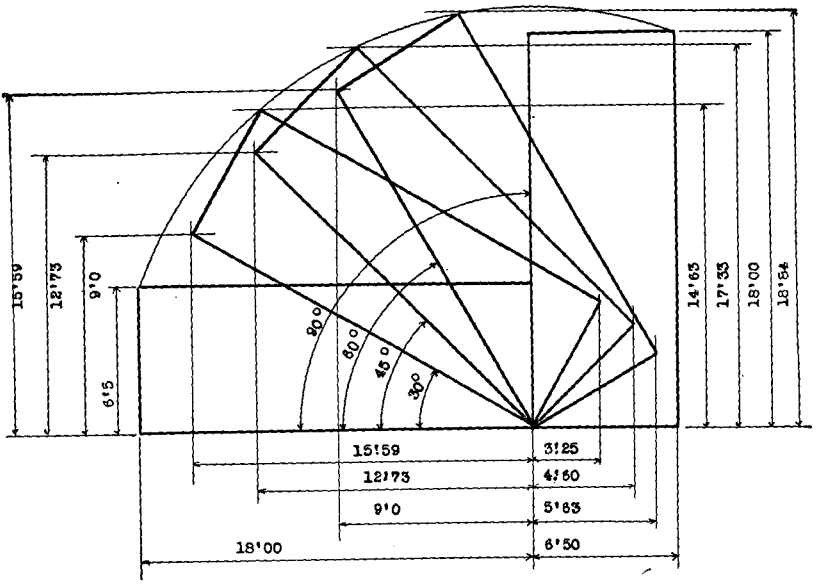
Parallel Parking

In attempting to utilize "horse and buggy" roads for twentieth century traffic, parallel parking is the preferable way of permitting both movement and parking on narrow streets. This type of parking is found more frequently than angle parking in the congested areas of larger cities.

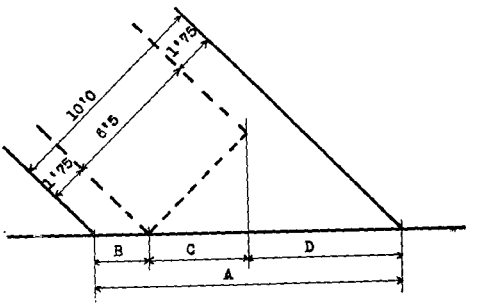
Permits Greater Use of Streets—Parallel parking permits greater use of the streets for movement, however, there are certain locations where even this type of parking should not be permitted. Traffic must be kept moving; to keep it moving, obstacles must be removed. Such a case is shown in Figure 15 which has been taken from a study made in a large midwestern city[26] and clearly shows

[25]*Getting Results Through Traffic Engineering*, National Conservation Bureau, No. 14, Series 2.

[26]*Street Traffic Conditions*, St. Paul, Minnesota, March 1940.



Curb Space for Ten Foot Parking Stalls



Parking Angle	*A*	*B*	*C*	*D*
30°	20′.00	3′.50	3′.25	13′.25
45°	14′.14	2′.47	4′.60	7′.07
60°	11′.55	2′.02	5′.63	3′.90
90°	10′.00	1′.75	6′.50	1′.75

FIGURE 14—Curb and Street Space Occupied for Various Parking Patterns
Cars 6.5 ft. x 18.0 ft.

the choking of traffic which is brought about by allowing parking on a street which also carries street cars in two directions. Obviously, there is not room for both. When conditions such as this are found to exist, there should be NO parking.

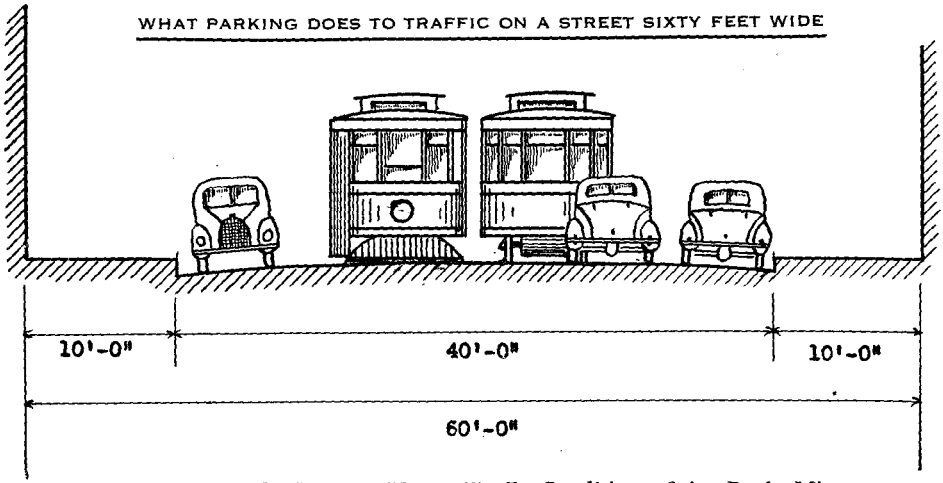


FIGURE 15—From the Report: "Street Traffic Conditions, Saint Paul,, Minnesota; March, 1940"

Most of the disadvantages claimed for angle parking may be reworded and listed as points in favor of parallel parking. Other advantages of parallel parking include the ease with which passengers may load and unload directly to the sidewalk without walking through the gutter.

Larger Stalls for Short-Time Parkers—Parallel parking permits five average length cars to be parked per 100 feet of curb. This permits the use of a twenty foot stall. However, when the time limit is short, as for instance ten or fifteen minutes, the spaces should be longer, that is from twenty-two to twenty-four feet so cars may enter and leave the spaces with more ease.

Center Street Parking

Some localities permit parking in the center of very wide streets. This is particularly true of small towns in the south and midwest. This type of parking creates, in effect, a one-way street system with parking in the center area dividing the opposing streams.

This type of parking may be either angle or parallel (Figure 16); though it is more frequently the angle type of parking which is found. Stalls should be well marked and ample space for move-

ment of traffic and maneuvering of parked vehicles must be provided if this type of parking is to be successful.

Notice the method of dovetailing the spaces for vehicles in parked position in the middle of street which saves 7½ feet in the width of the roadway over the usual method. The U. S. Army engineers were the first to adopt this plan at Gatun Locks, Isthmus of Panama, in 1926.

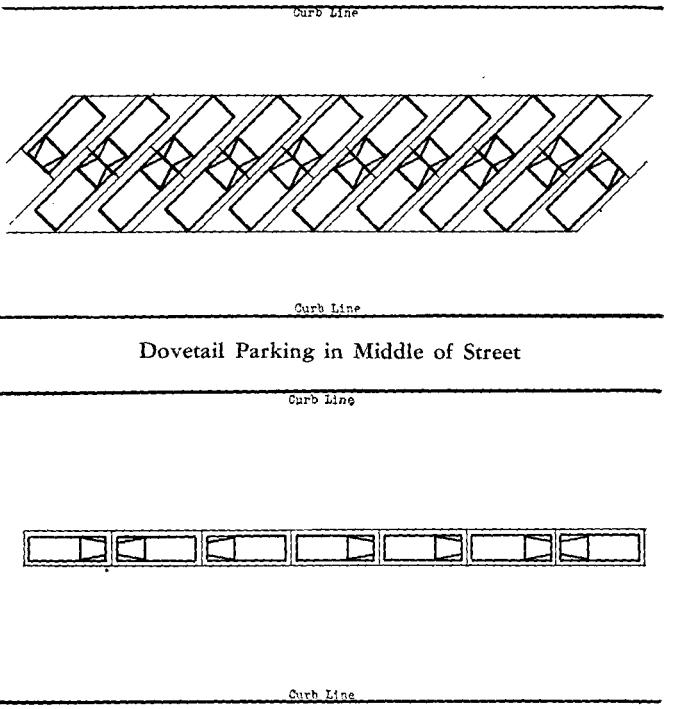


FIGURE 16—Examples of Center-Street Parking

Loading Zones

The whole pattern of movement for the various goods which must be moved both within and into and out of business districts should be carefully studied. In fact, it has been suggested that cities schedule and regulate all deliveries within the business district in accordance with some logically worked out plan. New York City has in operation a very successful plan for loading and unloading operations on certain streets in the congested sections.

Requiring trucks to load and unload at night has many advantages in relieving congestion from double parking and reduces

spaces needed at the curb for loading zones. Because much of the parking so affected consists of long-haul pick-ups and deliveries, such plans will not work satisfactorily except in cities which are natural ports, or trucking terminals. As an example, such a plan would probably not work too well in a city between New York and Boston, such as New Haven, because a large portion of the trucking would be done by companies operating betwen these two points. Night loading regulations would be too restrictive to their schedules. On the other hand, a plan of night loading and unloading has been found to work well in New York City.

Major problems which cities should consider with regard to the establishment of loading zones are:

Demands for Space Vary with Hours of Day—Certain perishable goods, for example, must be delivered to stores each morning for distribution to customers throughout the day. Farm produce, dairy products and other foods are dependent on day-to-day deliveries. Where such goods are now delivered at the curb, across the sidewalk, on major streets during the morning rush hours, new regulations may be necessary. Ordinances should require either loading off the street or deliveries during non-peak traffic hours.

Heavy Merchandise—Heavy merchandise, such as requires large space-consuming trucks and which often takes considerable time to load or unload, should not be handled at the curb during peak traffic hours. Preferably such heavy materials should not be loaded at the curb at all. The problem, however, must be looked at realistically in spite of the fact that it is in most cities a major factor in traffic congestion. This is but one of the many examples which can be cited to emphasize the need for drastic action in solution of parking problems. A situation exists where traffic demands must be met and obviously they cannot be met in most city business districts by such a simple expedient as a "new regulation." Curb loading of heavy merchandise should not ordinarily be objectionable late at night in business districts.

Some large cities which do not require trucks to load at night do prohibit them from stopping on the streets during peak hours. Very favorable results have been achieved in reducing accidents

and in expediting movements through this practice. It is, of course, most beneficial on streets where peak hour volumes are considerably greater than normal volumes.

Houston, Texas, requires early morning deliveries. San Francisco permits no trucks to stop during rush hours after 4:30 P. M. Philadelphia permits loading and unloading only on one side of the street in the downtown district except under special conditions where permits are required.

Several corrective measures have been tried. Trucks may be prohibited from standing backed to the curb during rush hours, or they may be permitted to remain standing at the curb for only from three to five minutes during rush periods. Either of these regulations would permit small deliveries but would prohibit the delivery of heavy merchandise. Where moving traffic volume warrants, "No parking" regulations will accomplish the same purpose. Again, it is obvious that no single or specific solution will solve every case. Which will serve best is a local problem and is dependent upon local conditions, such as traffic flow characteristics, types of business establishments abutting on streets under consideration, and frequency of deliveries when not regulated.

Investigate Use of Loading Zones—Use of loading zones, both for the purposes for which they are intended and illegal uses, should be carefully investigated. Applications for new loading zones should be decided on actual needs and traffic requirements. Passenger vehicles should generally be permitted to stand long enough to take on or discharge passengers or bundles. Extensive misuse may mean that the zones are larger than is necessary, that delivery vehicles are stopping in the traveled portions of the streets and not using the zones, or that some zones are not needed at all. One commercial loading zone in a block may, in certain cases, be adequate to serve the entire block. Some cities have recognized the importance of checking the use of loading zones and have, as a result, provided special police supervision where the loading and unloading operations are great.

Zones Not Properly Marked—Loading zone regulations may be violated because the zone is not properly marked. Zones should be

permanently marked with painted curbs and upright end markers on which the hours when the regulations apply should be plainly visible.

The Model Municipal Traffic Ordinance provides that charges may be asessed against users of commercial vehicle loading zones. Cities without such ordinances, however, have found that where it has been held illegal to charge fees for curb space that they could levy charges for the "placement and maintenance of signs and markings" essential to the loading zones.

"No stopping" regulations ordinarily preclude the use of loading zones during the periods when such "no stopping" regulations apply, on the basis that where two regulations, not in conflict with each other, apply to a given street or curb length for different periods of the day, the more restrictive is construed to apply.

The time when loading zone regulations apply should be carefully considered and indicated in accordance with the needs of the business establishments that they are intended to serve. Where the businesses served operate only during the day, and no deliveries are made at night, general parking should be permitted in the loading zones during hours when they are not used for loading.

CHAPTER IV

OFF-STREET PARKING

While curb parking should receive its full measure of attention in a parking plan for any urban area, it is generally agreed that the curb alone cannot furnish sufficient parking spaces for the demand which exists in urban areas at the present time.

To meet the problem, provision for adequate off-street parking space is one which faces the majority of our urban areas. Studies indicate that the number of off-street parking spaces now available varies from about 5 per cent to 30 per cent of the registered vehicles. The problem involves not only the provision of sufficient space, but of space properly located with relation to areas of concentrated land use, and space attractively priced so as to be accepted by the motoring public. These qualifications were recognized as early as 1923 at the National Conference on City Planning where it was stated that parking rates must not be "too high to be popular" nor parking locations "haphazard and illogical."[27]

Due to the increase in private car operation and the public demand for parking space, it is in many instances less expensive for the municipality to provide off-street parking facilities than to attempt to solve the problem by widening streets. Under certain conditions it is conceivably cheaper for a municipality to provide off-street parking for cars which demand short parking periods.

Types of Operation

There are three general modes of operation of off-street parking facilities:

1. Private facilities.
2. Privately operated public facilities.
3. Municipal facilities.

[27] *Day and Night Storage and Parking of Motor Vehicles*: Hugh E. Young, Proceedings 15th National Conference on City Planning (1923).

PRIVATE FACILITIES

Such facilities usually are operated in connection with retail stores, hotels or other business establishments. There are many ways of financing such facilities. In some cases, the motorist pays directly for the service, while in others the whole cost may be absorbed by the business establishment, or there may be some sharing of responsibility by the vehicle user and the business.

Combination Garage and Bus Service—To cite some of the most successful ventures in merchant provision of parking facilities, in St. Louis a combined garage and bus service has been established for the use of shoppers patronizing any of 130 stores and offices in the downtown section. Each time a purchase is made in a member store, ten cents is deducted from the total parking fee. These deductions are applied to reduce the regular rates of ten cents for the first hour, twenty cents for two hours, thirty cents for three to five hours, and thirty-five cents for all day.

In addition, frequent bus service is provided without charge along a route close to member stores. The success of this "Park-N-Shop" plan is measured by the fact that patronage in 1940 increased from 7,000 shoppers in January to 17,000 in April and 30,000 in August.[28]

Another successful example of a private venture is the Oakland, California, experiment started in 1929, known as the Downtown Merchants Parking Association. This organization, now comprising 164 members has acquired a number of strategically situated low-income properties for parking lots. Land is acquired either by purchase or by lease, with a ten year minimum term for leased property and an average rental of one and one-half cents per month per square foot. The rate for parking in the Oakland lots is ten cents per hour, but the motorist can park free for two hours by having his parking check validated in a member store, regardless of whether a purchase is made. Because of the comparatively high hourly rate after the expiration of the free parking period,

[28]*The Problem of Parking Facilities*, Report of the Department of Finance, Highway Research Board, 1940.

the rate of turnover per car space is quite high as compared to the average commercially operated public parking facility. In one of the seven lots operated by the Oakland merchants, the daily turnover is as high as ten cars per space per day.

At the end of each month, the Parking Association subtracts from its total costs the cash receipts received from non-validated or overtime parking, or from night parking which is provided for fifteen cents without validations. This cash income amounts to about 40 per cent of total costs. The number of validated checks is then divided into this net cost figure to obtain the unit parking cost per validated ticket, now about four cents per car and fifty per cent lower than when the organization began operations. The number of checks validated by each store is then multiplied by four cents to obtain the total charge per store. One member, a large market, pays as much as $1,000 per month to park its motoring customers. During 1940, over 1,250,000 cars were handled by the seven lots operated by the Merchants Association.

In cases where merchants contribute to the operation of lots or garages which are owned by others, it is obvious that this plan would lack permanency. If the land is not owned by the merchants who operate the garage, the likelihood always exists of having it sold for a use or a development which will return a higher revenue than will garages or parking lots. This condition makes the solution of the parking problem then quite temporary. In many cases, the properties for such use are owner-leased for very short periods so as not to have them tied up when more lucrative leases or uses become possible.

Privately Operated Public Facility

The second method of off-street operation which may be either a parking lot or a garage, is providing the major parking capacity in our downtown areas. This type of service has increased greatly in the past few years. In Los Angeles the number of off-street parking facilities increased from fifty in 1922 to 920 in 1938, with capacity expanding from 4,000 automobiles to 65,000. Chicago had sixty off-street facilities in 1927 and 237 in 1938.

The city of Boston is now in a position to take remedial action concerning its parking problem, due to enabling legislation recently signed by the Governor of Massachusetts. The legislation permits Boston to borrow $5,000,000 above its debt limit to purchase sites and construct off-street parking facilities. These parking lots and garages will then be operated by the highest private bidders. The schedule of parking fees will be determined by the city.

Municipal Facilities

The third type of facility may involve parking as a municipal operation, with facilities furnished free to the motorist or at low rates made possible through sharing of the cost by property owners or taxpayers.

The use of municipally owned and operated facilities has been largely the result of a failure on the part of private enterprise to provide parking areas properly located and in sufficient numbers. Public action in this field has been established for more than twenty years. Among the cities which established municipal parking facilities at an early date was Flint, Michigan, which took such action in 1924. In 1926, the city council of Lafayette, Indiana, authorized a bond issue of $52,000 to acquire lands for parking facilities.

Examples of Successful Operation—In 1936, the village of Garden City, Long Island, drew up a definite parking plan to serve its established business and apartment house section.[29] Land was obtained by condemnation and the village now is operating seven parking lots with others to be installed as the village grows. Parking is free and the cost of construction and maintenance are paid for by assessment against benefited properties.

Still another example of successful municipal operation of parking facilities is found in Kalamazoo, Michigan, where a large parking lot for shoppers is located in the central business district. A Shoppers Parking Lot Board of five merchants and property

[29] *A New Solution to the Parking Problem,* Allan H. Rogers. Public Works, Vol. 69, No. 7, July 1938.

owners meets periodically with the Kalamazoo City Manager to set operational policies. Details of the financing of this lot may be found in the succeeding section.

Parking Authorities and Commissions

Enabling Legislation Needed—Several cities have sought enabling legislation to create official public bodies to deal with off-street parking facilities. Such authorities or commissions are usually given the right of condemnation and the right to levy assessments to subsidize parking developments. They may be required to operate facilities directly or they may be authorized to lease publicly owned facilities to private agencies.

The idea of such public parking agencies is new and there is little experience on which to base recommendations. St. Paul, Minnesota, and Pittsburgh, Pennsylvania, are two of the cities in which parking commissions have been created, but neither has advanced sufficiently in its work to release programs and plans.

Non-political Body—Such authorities should be non-political and should provide a business medium through which all the agencies interested in improving the parking problems of a city can work together effectively. They may be especially effective in bringing together the parking interests of metropolitan areas comprised of parts of several incorporated places.

The success of public authorities has been demonstrated in recent years in the operation of toll bridges, tunnels and toll roads. They have procured funds at low interest rates and operations have been maintained at a very high business level so that the public has benefited. Such operations might be extended to parking facilities. However, there must always be proper governmental support, freedom from politics, and astute business management by experienced persons. Otherwise satisfactory and self-liquidating operations cannot be expected.

Authorities which require the endorsement of a majority, or fixed percentage, of the property owners in downtown areas before action can be taken to procure lands and levy assessments, may become involved in arguments and dissensions. Questions

among property owners as to who will benefit most in relation to the location of facilities and subsidy assessments are difficult to resolve.

Los Angeles, California, has organized a non-profit parking association to operate parking facilities. California state law permits formation of a Parking District.[23]

Parking Requirements for Buildings

Some governmental jurisdictions are approaching a solution to the parking problem by enacting ordinances and zoning regulations which require that minimum off-street parking spaces be required according to various land uses. Thus far, such plans have been applied only to new buildings. This is certainly one way to insure an adequate consideration of the parking problem in new developments. Zoning and off-street requirements for buildings have been thoroughly studied by the Eno Foundation. Results are available in a publication of the Foundation entitled "Zoning Applied to Parking."

Ordinances—One of the latest ordinances was adopted in Montgomery County, Maryland, July 5, 1945. According to the ordinance, "no application for a building permit for a commercial or an industrial building in any commercial or industrial zone shall be approved unless there is included with the plan for *such building or improvement a plot plan showing the required open space to be provided in connection with such structural improvement for off-street parking.* . . .

"The schedule provides that for theaters, auditoriums, stadiums, recreational establishments there shall be one parking space for each six seats. For each one-story commercial building devoted to retail trade, one off-street parking space for each three hundred square feet of floor area; for each commercial building in excess of one story, one parking space for each three hundred square feet of ground floor area and one parking space for each five hundred

[23] *Survey of Traffic Conditions in 24 of the Nation's Largest Cities.* Commerce and Industry Association of New York, Inc. December 1, 1945.

square feet of upper floor space; for office buildings, professional buildings, etc., one parking space for each four hundred square feet area of a one-story building and one space for each seven hundred and fifty square feet of upper floor area in addition in buildings over one story; for each restaurant, one parking space for each fifty square feet of floor area; for each hotel, one space for each five hundred square feet of sleeping room area. All off-street parking facilities shall be located on the site or conveniently near to the main building to which such parking facilities are pertinent."[30]

Arlington County, Virginia, has a zoning ordinance which requires that all dwellings constructed in residential, business or industrial districts must provide space for one automobile for each family unit or apartment on the same lot or plot on which the building is located.

Detroit, Michigan, requires one space of at least 200 square feet for off-street vehicle storage for use by occupants of each family unit in every new one and two family dwelling. Spaces must be on the same lot occupied by the dwelling.

Many cities apply such ordinances to apartments and multiple family houses where they are not applied to single family dwellings. Nutley, New Jersey, requires in apartments off-street area for one car for each two families. Santa Monica, California, provides a space on each building site for at least one automobile for each family unit.

Table XI shows a schedule of off-street parking space suggested by the city of Pasadena.

The above are samples of some of the ordinances for off-street parking in conjunction with dwellings. Many cities now have such ordinances and it is interesting to note that there is wide variance between them as to the amount of space to be provided as well as to the location of space with reference to the buildings. Some require as little as 60 square feet of off-street parking space per family unit, while other cities require as much as 200 square feet of off-street parking space for each family unit. In most places the

[30] *News Letter*, American Society of Planning Officials, Vol. 11, No. 8, August 1945.

TABLE XI

SCHEDULE OF OFF-STREET PARKING SPACE[31]
SUGGESTED BY THE CITY OF PASADENA CITY PLANNING COMMISSION
TO BE INCORPORATED IN A PROPOSED ZONING ORDINANCE

TYPE OF BUILDING	BASIC UNIT	ONE PARKING SPACE FOR THE NUMBER OF BASIC UNITS SHOWN NO. OF BASIC UNITS		
Commercial Buildings devoted to: Retail or mercantile business offices	Gross floor area sq. ft.		400	
Auditoria				
School	Seats number		12	
Commercial	Seats number		5-8*	
Churches	Seats number		8-10*	
Theaters				
Dwellings				
Single family	Dwelling unit number		1[a]	
Multiple family	Dwelling unit number		1[a]	
Hotels		1st 20	20-40	over 40
Residential	Dwelling unit number	20	4	6
Commercial	Dwelling unit number			
Zone M Uses	Gross floor area sq. ft.		40,000[b]	

*Subject to further research.

[a]No storage area shall contain space for more than 4 vehicles—one off-street loading space for each.

[b]In excess of 10,000 sq. ft.

spaces must be adjacent to the building or on the same plot, while in others, the space may be provided within 500 feet. It is apparent that much study and research is needed to ascertain accurately the minimum spaces needed for off-street parking in connection with dwellings. Indeed, these needs will vary considerably in different localities and cities. In most areas it is believed that one space for each family is considered as a minimum requirement.

Cities and counties are also applying ordinances and zoning regulations which require off-street parking facilities at hospitals,

[31]*A Statement of the Parking Problem;* Nathan Cherniack, Highway Research Board, 1945.

hotels, restaurants, roadside stands, retail stores, theaters and other businesses.

"Parking provisions are required for hotels in Southampton, New York, and Plainfield, New Jersey. Southampton's zoning ordinance requires the hotel to provide 300 square feet of private parking space on the same lot as the hotel or within 200 feet for each sleeping room. South Plainfield makes the requirement 200 square feet.

"The theater parking provisions in most of the zoning ordinances specify accessible parking space near the theater big enough to accommodate at least one car for every five to ten seats. Evanston and Riverside, Illinois; Mequon, Wisconsin; and San Marino, California, are among cities with such provisions."[32]

Off-street Loading Facilities

Because of the many difficulties encountered by commercial vehicles in finding adequate curb space for loading and unloading operations in downtown districts, it has become a common practice in many cities to require commercial and industrial establishments to provide off-street spaces for these activities. It can be stated as an axiom that downtown districts of cities do not provide sufficient curb space for parking, making loading and unloading facilities off-street a must. Even where such requirements do not exist, it has become a matter of "good business" recognized by many building owners and merchants to construct off-street loading facilities so that deliveries to and from their establishments can be expedited as much as possible.

Interior Block Locations—In some instances, groups of merchants have collaborated in procuring space for constructing loading facilities at interior block locations where individual spaces were not available and a single terminal would serve a group of business establishments. Such rear-block facilities are often used jointly as customer parking facilities.

Ground Floor Loading Platforms—In some of the more densely constructed cities, sections of the ground floors of buildings have

[32]News Bulletin of Public Administration Clearing House, 1940, Release No. 3.

been converted from conventional uses to off-street loading platforms. A typical case of this kind is shown in Figure 17.

Courtesy Port of New York Authority

FIGURE 17—Ground Floor Loading Platform

It is recommended that cities adopt some ordinances which require new buildings or rceonverted buildings to provide off-street loading and unloading space appropriate to the size and needs of each establishment. Recommendations of the New York City Regional Plan Association have such space requirements which are shown in Table XII.

A makeshift off-street loading bay may be provided where adequate sidewalk space permits by constructing offsets on short turnouts so that commercial vehicles pulling into them will not protrude into the street.

Curb Cuts—As will be mentioned in the following section dealing with parking lots, control must be exercised over the number and size of curb cuts in connection with off-street loading spaces. In

TABLE XII

OFFSTREET TRUCK LOADING AND UNLOADING BERTH REQUIREMENTS PROPOSED FOR NEW YORK CITY BY REGIONAL PLAN ASSOCIATION[31]

EVERY BUILDING DESIGNED TO BE USED FOR						REQUIRED NO. OF BERTHS	
MANUFACTURING STORAGE OR GOODS DISPLAY, DEPT. STORE OR HOSPITAL SQ. FEET OF GROSS FLOOR AREA			OFFICE PURPOSES OR HOTEL FOR TRANSIENT PURPOSES SQ. FT. OF GROSS FLOOR AREA			EACH INCREMENT	TOTAL
1st	25,000	25,000	1st	100,000	100,000	0	0
next	15,000	40,000	next	50,000	150,000	1	1
next	60,000	100,000	next	250,000	400,000	1	2
next	60,000	160,000	next	260,000	660,000	1	3
next	80,000	240,000	next	310,000	970,000	1	4
next	80,000	320,000	next	330,000	1,300,000	1	5
next	80,000	400,000	next	330,000	1,630,000	1	6
next	90,000	490,000	next	330,000	1,960,000	1	7
			next	340,000	2,300,000	1	8
each adnl.	90,000		each adnl.	350,000		1	

order that a pedestrian hazard will not be created, these curb cuts should be held to a minimum and sufficient distance should be left between successive curb cuts in order that pedestrians may have adequate zones of safety. It is also desirable wherever possible to arrange for separate entrance and exit drives so that wide drives and two directions of traffic will not have to be encountered by pedestrians.

METHODS OF FINANCE

Payment for off-street parking in the central city varies considerably with the methods used to provide facilities. Methods of financing for private facilities have been discussed in a previous section where several examples of this type of operation were cited.

It is logical to require those who create the demand for parking and terminal facilities and who benefit greatly from motor vehicle

[31] *A Statement of the Parking Problem;* Nathan Cherniack, Highway Research Board, 1945.

borne trade, to pay a substantial part of the cost of providing the facilities. It is not fair to assess all of the cost of off-street parking to the automobile user. Taking his investment in the vehicle as a basis, he already pays relatively more in the form of fuel and lubricant taxes, registration, driver and other imposts than any other class of our citizens. Besides which, he is only one of the many affected by the condition.

Under private operation of public facilities, the land used for parking is generally leased for an amount sufficient to pay taxes. In addition to this payment of rent, additional cost items include a return to compensate for the management of the enterprise and a license fee payable, as a rule, to the city.

If off-street facilities, particularly parking lots, are located where the real demands exist, they are usually on the city's most expensive land—people make business and business makes land values. When parking rates for such facilities are fixed so as to allow a fair profit after fixed charges have been satisfied, they are almost always too high to attract capacity use. This makes it very difficult to justify land use in downtown areas as permanent parking facilities. The rule is to operate stop-gap lots on such parcels of land until such time as it can be converted to more profitable use.

There are many ways in which a city might encourage private operation of public parking facilities. Municipalities might subsidize private operation of parking lots by lowering assessment of land so used, on the theory that parking facilities constitute a public utility. Costs might also be lowered by tax abatement or by the elimination of license fees, and the advantage passed on to the motorist through regulation of parking rates by the city. This, in effect, means city subsidy of private operations, raising a grave question as to whether or not such practice is desirable. Experience, especially in small cities, would indicate that such subsidy is desirable, even though it might be logically asked why the city should not also subsidize mass transportation and other public travel enterprises. Some students of government indicate that public subsidy of private businesses is dangerous, but it is very common in present day life and is often found in traffic activities.

The question of financing has been the principal deterrent to the development of municipally operated parking facilities. Land used for these facilities is often in the hands of the city and does not have to be acquired specifically for this purpose. When such is the case, the problem of financing parking is generally negligible. In many instances, however, the city does not own satisfactory sites, making it necessary to purchase, condemn or lease land for this purpose. The problem of financing may then be solved in a number of ways.

Municipal Bond Issues

It is necessary to investigate the legality of a bond issue by the city to finance parking facilities. In Michigan, for example, specific enabling legislation has been enacted to permit cities to issue revenue bonds for this purpose, thus placing parking facilities on the same status as water supply, sewage disposal or any other activity which may be financed by such bonds.

Use of Revenue from Parking Meters

As was pointed out in Chapter III, the income from parking meters is appreciable, averaging about $75 per meter per year. Since these monies should be earmarked for traffic improvements, it is logical in most cities to apply some to the financing of off-street facilities.

Under some city charters and state constitutions, a city cannot collect revenue as a result of such a police function as parking meters in excess of administration and attendant costs. Where revenues do exceed costs, it is recommended that their first use be to provide off-street facilities. A municipal parking plan submitted by the Civic and Business Federation of White Plains, New York, included as one method of financing off-street facilities, the use of an estimated $24,000 per year meter receipts.

Assessment to Immediately Benefited District

Many cities have issued bonds to cover the entire original cost of acquisition and development of land, and then have assessed a certain per cent of the total cost against benefited properties.

Where this plan has been used, the proportion assessed back to the benefited properties varies from 10 to 100 per cent. In Kalamazoo, Michigan, the entire cost of a shopper's parking lot was assessed against 120 benefited properties. The districts to be assessed were determined by the city assessor with a group of twenty-five citizens. Three zones were decided upon, known as A, B and C. Zone A, consisting of 178,000 square feet was assessed 40 per cent of the total. Zone B, consisting of 270,000 square feet, was assessed 40 per cent of the total cost. And Zone C, consisting of 290,000 square feet, was assessed 20 per cent of the total cost. These assessments were based upon 50 per cent according to area and 50 per cent according to assessed valuation.

Direct Fees from Users

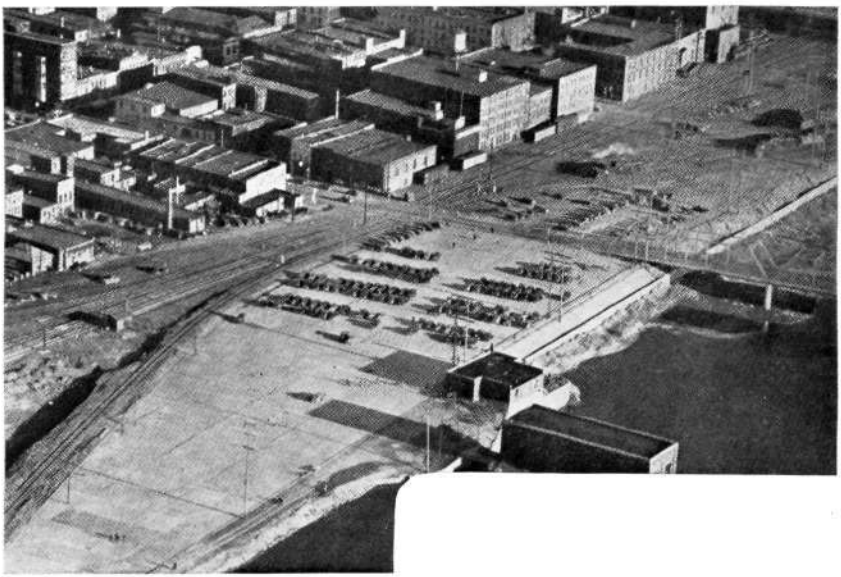
The original financing of a parking facility may be by bond issue, and amortization may be accomplished by charges made against the motorist at the time he uses the facility. A variation of this type of financing might allow the city to sell license tags, to be mounted on the vehicle, which will permit the owner to park in one or more of a number of municipal parking facilities. The owner should be issued an identification tag to carry on his person which should contain the same serial number as the tag on his car.

Income from City Utilities

Another unique method of financing off-street parking facilities is found in Ottumwa, Iowa, a meat-packing and agricultural trading center of slightly over 30,000 population. The city operates a municipally owned parking lot with space for nearly 1,000 cars. The lot is hard-surfaced, fenced-in, attended by men in police uniform and is well lighted.

Parking is free to all motorists and there was no assessment made on benefited property nor were taxes raised to pay for the improvement. The parking facility was constructed in connection with the purchase of a water works and power plant a few years ago. Swamp land was filled in along the river bank, sewers were covered over, and a parking lot was the result. All expenses of construction were paid from the profits from the water and power

plants. The cost amounted to about one year's profits of the city-owned utilities.



From the Report: "Keep Customers Coming," by the American Retail Federation

FIGURE 18—Municipally Owned Parking Lot, Ottumwa, Iowa

Figure 18 shows the attractive parking lot which was the result of combined efforts of city officials, merchants, newspapers and the public.[33]

Legal Aspects of Municipal Facilities

Municipalities planning to establish public parking facilities may find it very helpful if they would carefully check the extent of their power before condemning or purchasing the desired lands or before converting lands acquired by tax delinquencies or for other public uses into public parking places. Although these powers vary in the different states, they may be found in the state constitutions, municipal charters and the general or special acts of state legislatures.

Fifteen states have passed state-wide enabling legislation allow-

[33]*Keep Customers Coming*, American Retail Federation, Washington, D. C.

ing the use of condemnation proceedings in obtaining sites for off-street terminal facilities, while about fifteen other states have similar legislation applicable to specific cities, towns, or counties.[34]

Right of Assessment Questioned

In at least two states, action contesting the right of the municipality to assess the costs of parking facilities against benefited properties has gone to higher courts of the state. In both cases, the municipalties were upheld and it was the decision of the courts that the municipalities were within their legal rights in assessing the costs of public parking facilities to properties within certain districts which derive benefits from the parking facilities.

Location of Facilities

Studies Relative to Location

Existing Off-Street Facilities—Surveys should be made of existing off-street facilities so as to ascertain what accommodations are already available. Such studies involve principally a field inventory of lots and garages. Information recorded would include the location and type of each facility, land area occupied, vehicle capacity, use of facility at different periods of the day, and of schedule of charges. The location and capacity of facilities can be entered on city maps to ascertain the areas of the city not served by off-street parking. Zones of influence for each facility should be determined based on the maximum distance which motorists can be expected to walk to their ultimate destinations after parking. (500 to 1500 feet depending on community habit).

Demands for Off-Street Facilities—Some areas of downtown districts may not need additional off-street facilities, while some areas having some facilities may need more. It is important, therefore, that careful studies be made to determine demands for off-street facilities and the efficient use of existing ones. Such studies involve surveys of origins and destinations, cordon counts, zoning restrictions, and land use surveys. Studies should be made of business

[34] *Some Thoughts about the Functioning of Urban Off-Street Motor Vehicle Terminals.* F. W. Lovejoy, Highway Research Abstracts, 1946.

units and block areas to ascertain parking generators. They should be made of pedestrian volumes, store sales, and store door counts to study parking generator characteristics to properly evaluate parking demand. The Highway Research Board, the U. S. Public Roads Administration, the Institute of Traffic Engineers and many city and state groups are now engaged in the development of improved parking survey techniques. Persons interested in such studies should contact one or more of these agencies for professional assistance and counsel.

The characteristics of automobile parkers, cited in the previous chapter, indicate the necessity for distributing parking facilities throughout the downtown districts. It is more desirable to have a large number of small facilities than a few large ones. In this way, the facilities can be spread throughout the area of demand so that they will be convenient to major streets and routes as well as parking generators. This reduces the walking distances and spreads the traffic loads—of particular advantage during peak hours. A typical distribution of parking areas is shown in Figure 19 taken from a recent study in Anaheim, California.[35]

Most parking facilities now in operation came into existence because bulidings which formerly occupied the land became financial liabilities. Buildings were razed to lower assessments and the land was then used for parking purposes because such use offered the best opportunity for immediate cash returns with a minimum of capital investment. Lots were thus located in a haphazard and chance manner, frequently in areas where a large majority of the buildings were below standard, and often some distance from the retail shopping center of the city.

However, the trend has more recently become that of attempting to locate parking facilities where they will fit more closely the needs of traffic. Since the demands of traffic for terminal facilities almost invariably are at a maximum in the already overcrowded central business district, the question of where to look for land for parking purposes warrants careful study.

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[35]*Off-Street Parking Study for City of Anaheim;* City Planning Commission, Anaheim, California, 1945.

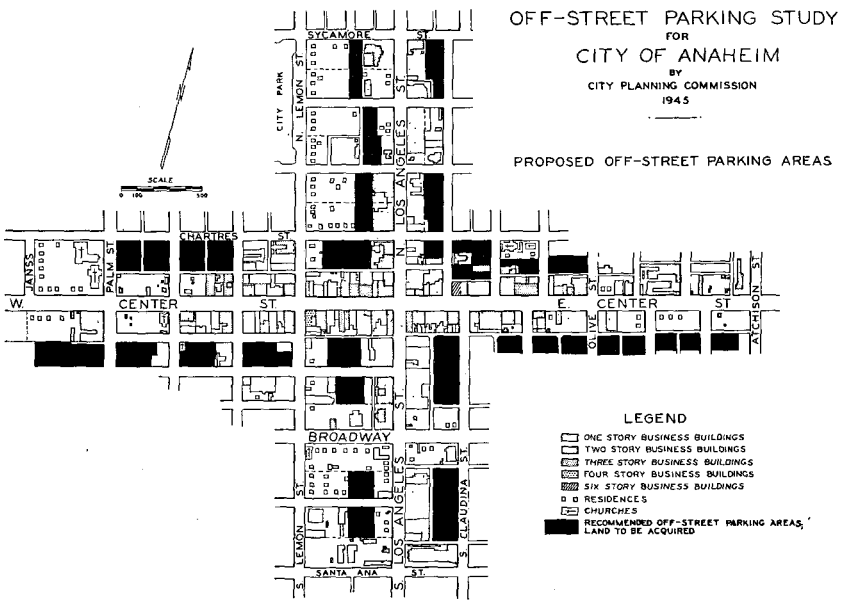


FIGURE 19—Proposed Off-Street Parking Areas for City of Anaheim, California

Block Interiors

In discussing the parking problem, Mr. G. Donald Kennedy, Vice-President, Automotive Safety Foundation, points out that block interiors may provide space for off-street parking facilities.[36] A sketch presented by Mr. Kennedy is reproduced in Figure 20. Block E in this sketch shows the use of block interiors.

Economically Sound—A study made recently in New Haven, Connecticut, produced some interesting results showing the economic feasibility of using block interiors for off-street parking facilities.[37] Assessed valuations for street front property and interior block property were compared in fifteen city blocks within the central business district of New Haven. These values were reduced to a square foot basis, and Figure 21 shows these values

[36] *The Parking Problem Can Be Solved*, G. Donald Kennedy, The Rotarian Magazine, April, 1946.

[37] *An Economic Study of Interior Block Parking Facilities*, C. S. LeCraw, Jr. Thesis, Bureau of Highway Traffic, Yale University, May 1946.

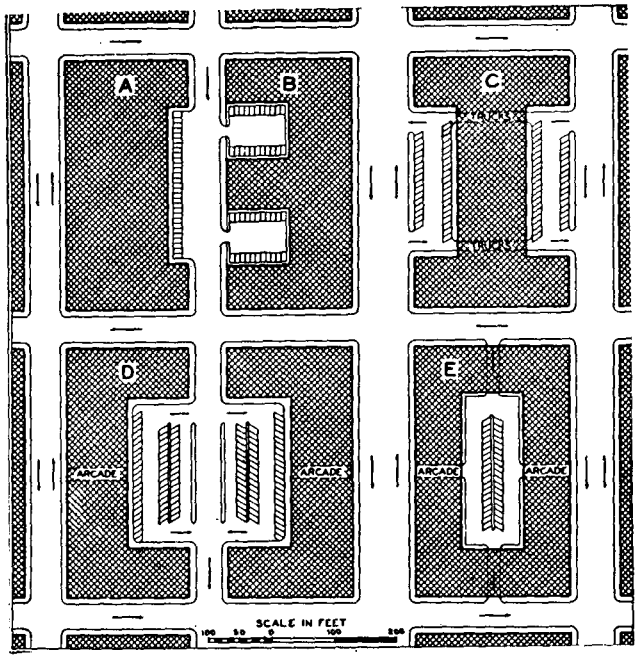


Illustration furnished through the courtesy of the Rotarian Magazine

FIGURE 20—Five Types of Parking Areas for Small Town or Neighborhood Centers (All provide more space than curb parking, Block E, showing interior courts, is applicable in almost any city. Note that all blocks are small. A large block permits even better parking areas)

for both street front and interior block property at various distances from the center of the city. It can be seen that in the block located 400 feet from the center of the city, there is a difference in square foot valuation of approximately $18.00 between the street front property and the interior block property within this block. Allowing 180 square feet per car space, a saving of $3,240 per car space may be realized by using the block interior for off-street parking.

Figure 21 shows that the areas closer to the center of the city offer a proportionately greater saving by the use of block interiors for parking facilities. It is this area, in the heart of the central business district, where parking demand is usually greatest.

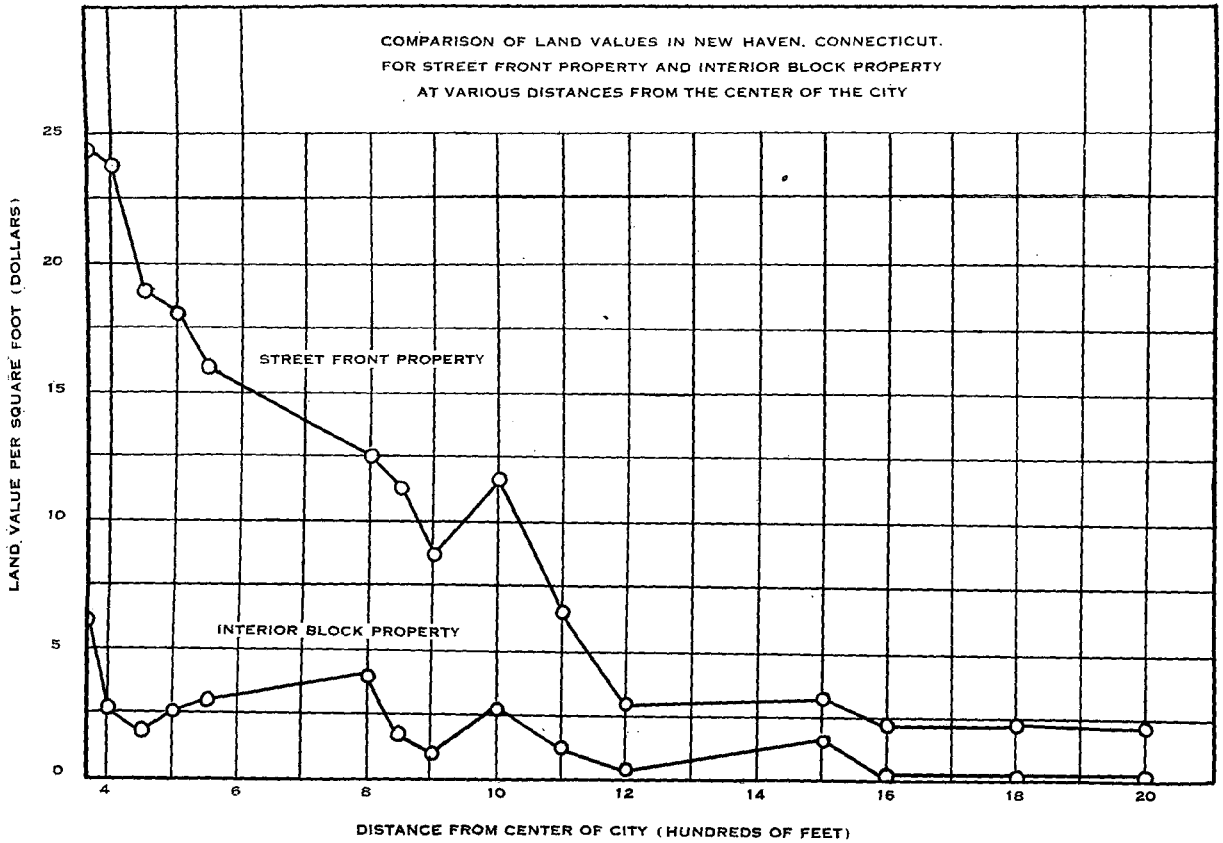

COMPARISON OF LAND VALUES IN NEW HAVEN, CONNECTICUT.
FOR STREET FRONT PROPERTY AND INTERIOR BLOCK PROPERTY
AT VARIOUS DISTANCES FROM THE CENTER OF THE CITY
LAND VALUE PER SQUARE FOOT (DOLLARS)
25
20
15
10
5
0
STREET FRONT PROPERTY
INTERIOR BLOCK PROPERTY
4
6
8
10
12
14
16
18
20
DISTANCE FROM CENTER OF CITY (HUNDREDS OF FEET)

FIGURE 21

Block Interiors Now Used Inefficiently—These interior block areas are often used haphazardly and wastefully, and frequently become eyesores to the community. If properly laid out, these areas serve to house a large number of cars. They may be used as loading areas and, if properly operated and maintained, may become an asset and improvement to the areas in which they are located. The plan of using block interiors for parking vehicles and for service access has often been called "the self-contained block."

Examples of Use—This method of providing off-street parking facilities has been effectively employed in Garden City, New York. Merchants in Garden City have constructed show windows and suitable rear entrances to take full advantage of block interior parking lots. One merchant reported that more customers entered his store through the parking lot entrance than through the door fronting on the street.

Entrances and Exits—Entrance and exits to interior block facilities may be obtained by easement rights through the ground floor of a multi-storied building. An example of this type of entrance is shown in Figure 22. This may not be necessary if alleyways through the business blocks are already in the possession of the city.

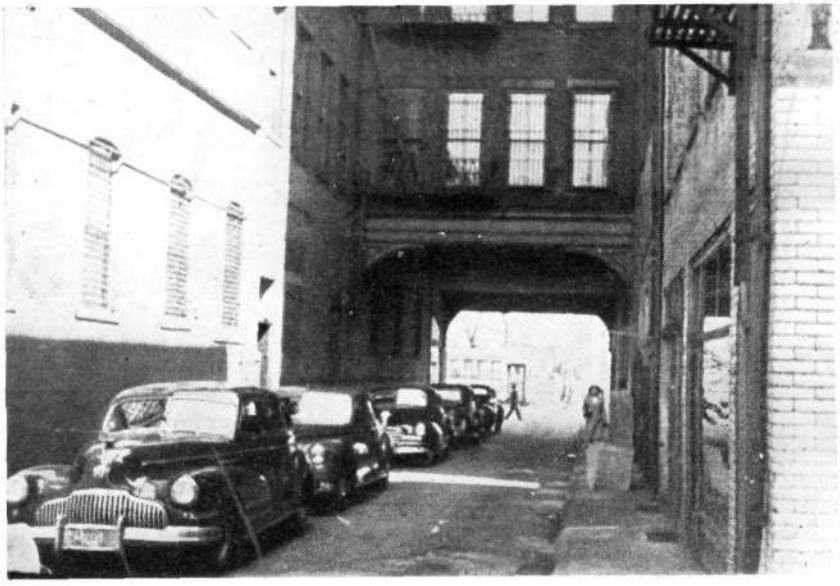
A study of this type by any city contemplating the construction of off-street facilities will prove to be very helpful and may, with a minimum of expenditure, allow the acquisition of land for parking facilities.

Fringe Areas

Lower Land Values—Areas on the fringe or periphery of the central business district are generally much less valuable as business properties and are, therefore, less costly to acquire. However, it is not likely that this plan can ever provide a complete solution for the total problem.

Many cities have reported successful operation of parking facilities in such locations, among them, Cleveland and Detroit. Private autos are parked outside the congested areas and mass transporta-

Front



Rear

FIGURE 22—Example of Ground Floor Entrance to Parking Facility Through Multi-storied Building

tion facilities are used for travel to and from the parking lots and downtown.

In Cleveland, bus service is given on two and one-half minute headways from a privately owned and operated parking lot located just outside the business district. All day parking costs fifteen cents and bus fare to any point in the business district is five cents. The total cost for all day parking and transit fees is twenty-five cents, which is cheaper than the parking fee charged in many downtown lots.

The shuttle bus service is offered from 8:00 A. M. to 5:30 P. M. to attract off-peak patrons. The parking lot has been filled to capacity since the bus service was inaugurated.[38]

Other examples of successful operation of fringe parking facilities may be found in Denver, Colorado, and Atlanta, Georgia.[39] In Denver, two war veterans have initiated a service from an outlying parking lot to downtown department stores. A station wagon is used as the shuttle vehicle. A minimum of delay is caused by unparking. Direct telephone lines from the downtown stores to the parking lot allow the shopper's car to be waiting when he arrives.

In Atlanta, thirty-five cents buys parking and round-trip transportation into the central district over any of several bus or trolley routes. Parking is one and one-half miles from the central district and is operated by a motion picture theater.

Fringe parking was found to be an unsatisfactory solution to the problem of providing parking for shoppers in Cincinnati.[39] A ninety day experiment in shuttle bus and fringe parking operation was recently concluded. This service was offered between the hours of 9:00 A. M. and 4:00 P. M. and the parking lots were being used to only a small percentage of their capacity and the bus operation suffered a loss. The city does not consider fringe parking as a failure. It is the belief that the plan would have succeeded if sufficient buses had been available to extend the service beyond the hours of 9:00 A. M. and 4:00 P. M.

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[38] *Public Works Engineers Newsletter*, Vol. 13, No. 1, July 1946.

[39] *News Report*, Automotive Safety Foundation, September 10, 1946.

Disadvantages—There are certain disadvantages to this type of parking operation. It overlooks many human nature aspects of automobile use. Studies have shown a decided reluctance on the part of the public to transfer from one type of transportation to another. This must be overcome in the operation of fringe parking areas by careful scheduling of transit facilities to and from the parking area in order to require a minimum waiting period for the persons using the parking area. In inclement weather and during seasons of extreme cold, persons will not use such facilities requiring a transfer from their private cars to a mass carrier unless comfortable waiting facilities are provided.

Many persons require the use of their private cars during the day in connection with their business and for personal reasons. This type of driver cannot be expected to use a parking area on the fringe of the city which requires a trip by mass carrier each time it is necessary to use his car.

The opposition of the public to crowded and unpleasant travel on bus and street car lines is often overlooked by those advocating fringe parking. The "free-wheel" characteristics of private autos will be insisted upon in most cities—all except the largest cities.

In addition to locating parking areas on the fringe of the central business district, many parking areas have been located on the fringe or in the outskirts of the city, sometimes several miles from the congested section. Many examples of this type of facility may be seen in the suburbs of large cities such as New York and Chicago where many drivers park their vehicles in the vicinity of railroad stations and commute by train to their destinations.

While this type of fringe parking is successful, its attractiveness lies in the long distances and time savings involved. Commuter trains and subways offer decided time savings where persons live long distances from downtown areas. Such savings are not generally found in the moderate sized cities because distances involved are relatively short. Also, surface street car lines and buses can offer no particular attractive time schedules such as are offered by trains, subways and elevated railways.

Types of Facilities

Controlling Factors

The type of off-street parking facility is influenced by a number of factors including availability of land, land cost and parking demand. Whether the facility is a parking lot or any of a number of various types of garages, parkers will insist that it be well planned and operated in an economical and efficient manner. It has been generally agreed that most motorists will not wait for delivery of a car at an off-street facility for more than five minutes. This time preferably should be reduced to three minutes or less.

Parking Lots

Most Common Type of Facility—The parking lot, because of low cost, is the most common method of providing off-street parking space in the average city. Reports from seventy-two cities during a parking study made by the American Automobile Association[6] indicated that 58 per cent of the total off-street parking space in these cities was in open parking lots and that these lots enjoyed 78 per cent of the off-street parking business. Figure 23 shows this relationship in a typical study made in Los Angeles.[40]

Temporary Nature of Lots—Most of these lots, however, were originally placed in operation as a temporary means of obtaining some revenue from vacant properties until such time as the properties could be used more profitably for other purposes. As a result of this condition, most parking lots were operated on a transitory basis, with short leases—usually not exceeding 90 days—and much dissatisfaction was experienced on the part of the motoring public.

Many owners and operators of parking lots now regard these facilities as more profitable and more permanent investments, and many lots are being made more attractive.

Standards—Many cities have set up standards which must be met before parking lots receive a license. Most cities require that lots

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[6]*Report of Committee on Parking and Terminal Facilities*, American Automobile Association, 1940.

[40]*Report of Traffic and Transportation Survey*, City of Los Angeles, 1940.

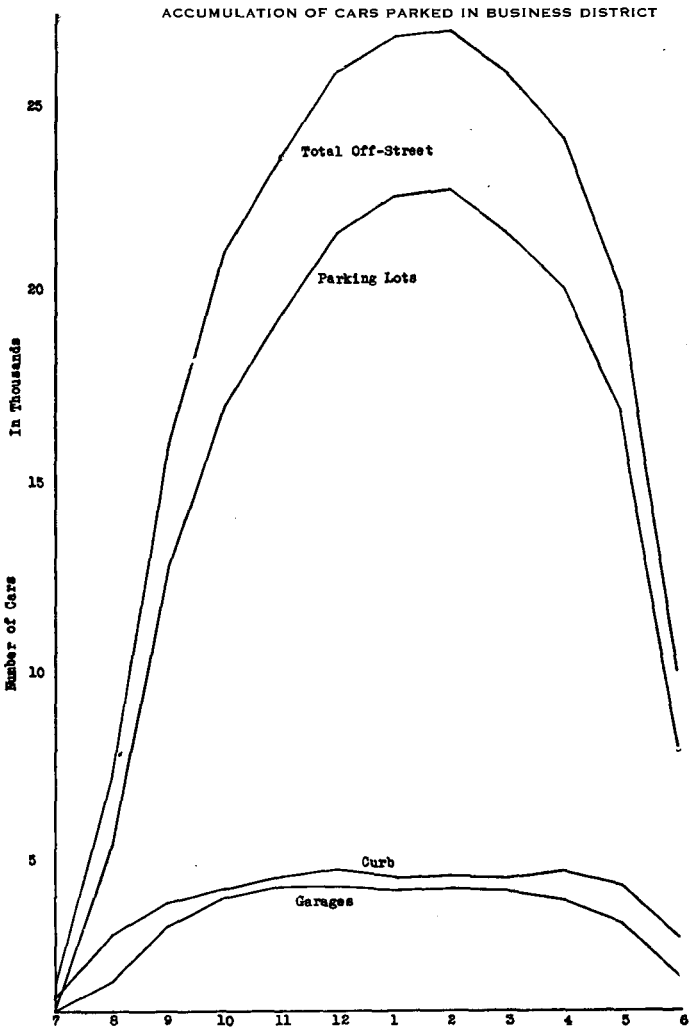


FIGURE 23—Parking Study in Los Angeles, California, Report of Traffic and Transportation Survey published in 1940

be enclosed with a suitable fence, wall or other barrier so that vehicles cannot be removed except through regular entrances and exits. Toledo, Ohio, provides that the entrance and exit may or may not be combined, but that all openings shall be properly attended during the time the lot is in operation.

Fences and barricades, as a rule, are erected on lots abutting public space. Generally this must be done under permit from the city engineer. Washington, D. C., requires that every parking lot abutting public space have a coping or fence built entirely on private property, the coping to consist of an eight inch coping of concrete and a fence of approved design to be not less than two and one-half feet high. Baltimore requires a masonry wall not less than two and one-half feet high or some other approved barrier which would not obstruct the view of drivers or pedestrians.[41]

Surfacing, grading and dust prevention are required in many cities for parking lots. Detroit and Rochester require that parking lots must provide for dust abatement by frequent sprinkling or the use of calcium chloride or other means. Jacksonville, Illinois, requires that parking lots have a gravel or cinder surface and must provide stalls for the parking of cars. Los Angeles requires that in parking lots in residential districts, the property must be surfaced and in many instances the planting of hedges around parking lots is required. Oakland, California, requires parking lots to be level and surfaced with gravel or macadam. Because of layout, landscaping and surface treatment, the municipal parking lots of Chicago and Garden City, New York, are among the most attractive in the country.

Curb Cuts and Driveways are controlled to reduce hazards to pedestrians by excessive widths. Private driveways have been the cause of many cities setting up minimum standards for curb cuts and driveways. The usual procedure is to require that an application be submitted, with detailed information including plans drawn to scale. The width allowed ranges from 16 to 30 feet at the lot or sidewalk line. In Dayton, Ohio, driveways in excess of 8 feet are termed "special privileges" and the permit is granted only after the application has been advertised for two weeks, a hearing held and the application finally approved by the city council. The maximum width in Dayton is 30 feet.

Most cities require that the sidewalk line between driveways opening on the same street be at least 10, 15, or 25 feet wide. Often

[41] *The Parking Problem in Central Business Districts,* Nolting and Oppermann, Public Administration Service, 1939.

a limitation on the proximity of driveways to street intersections is set. Where application is made for more than one driveway, an investigation is advisable to consider the amount of pedestrian and vehicular traffic on the sidewalk and street adjacent to the property. The city should require that when the driveway is constructed, the existing curb and gutter and sidewalk be removed and reconstructed as an integral part of the driveway and subject to approval by the city engineer.

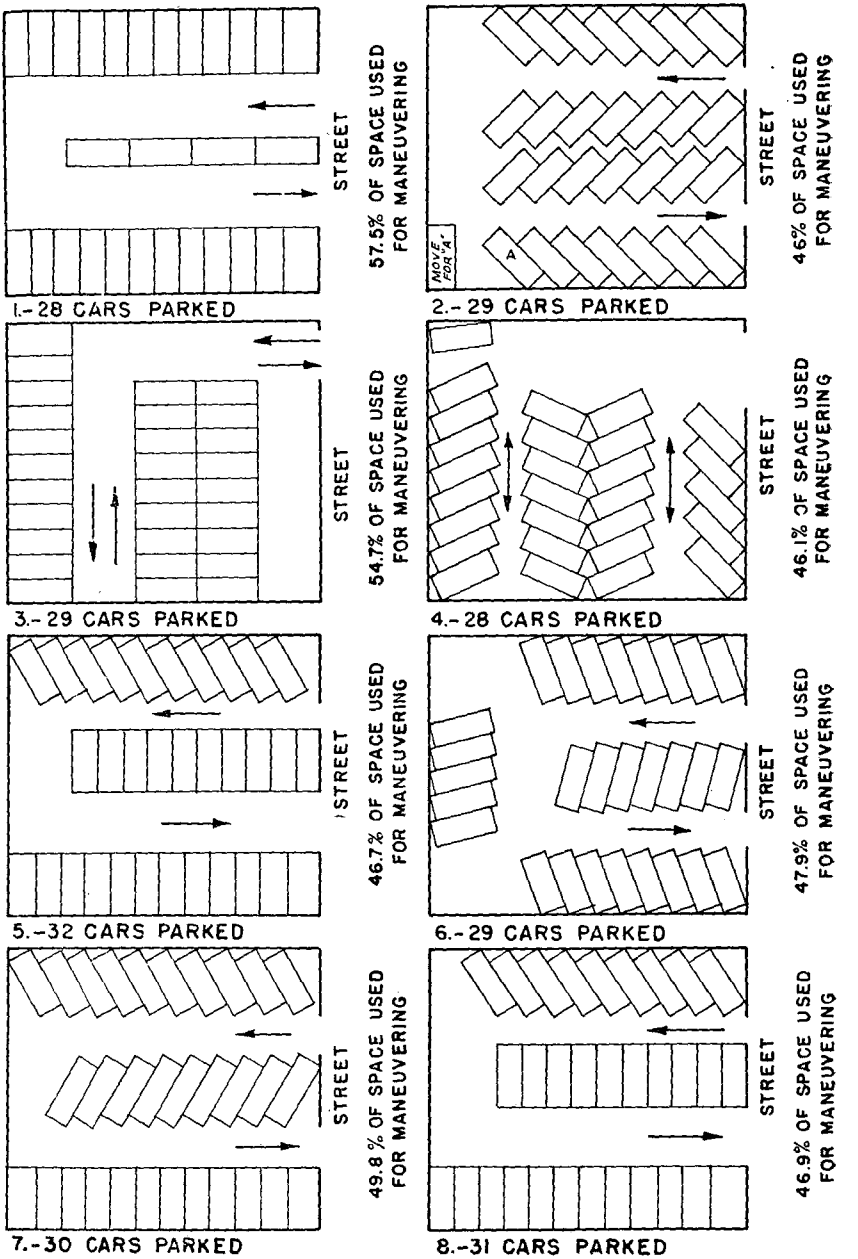
Layout of Parking Lots—There is no definite system of laying out parking lots. Each lot will be designed to permit the maximum use of the area under local conditions. Ordinances may require that a minimum number of square feet be allotted to each car. One hundred eighty square feet is believed to be a fair minimum. It might also be required that cars be parked not more than two rows—or not more than "two deep"—so that not more than one car must be moved in order to get any car out of the lot.

Eight methods of parking are illustrated in Figure 24 and recommended entrance and exit designs are shown in Figures 25 and 26.[42]

Examples of well designed parking lots are shown in Figures 27 and 28 which show municipal parking facilities in Kansas City, Kansas and Oakland, California. The illustration of a Kansas City lot shows but one lot of a group of six which are in use in the central business district of Kansas City, Kansas.[43]

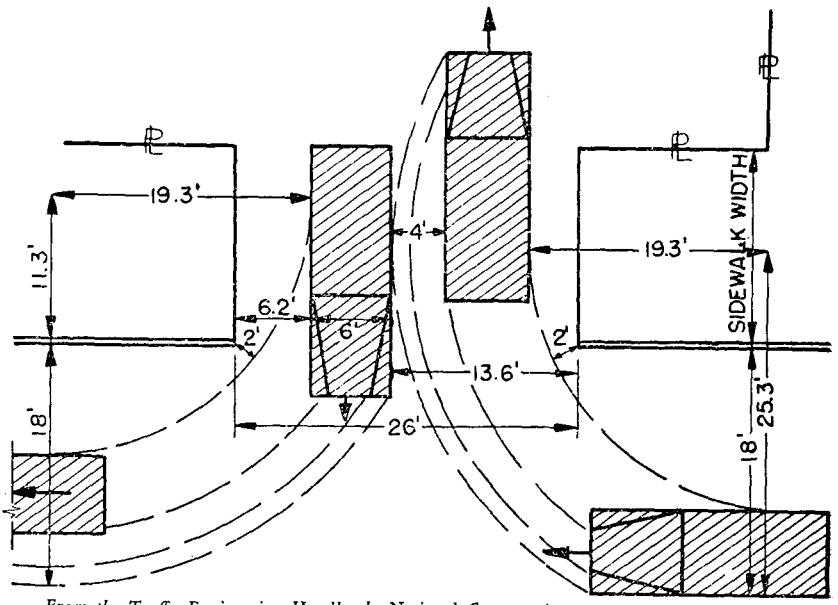
[42]*Traffic Engineering Handbook*, Hammond and Sorenson, National Conservation Bureau and Institute of Traffic Engineers, 1941.

[43]*News Reports*, Automotive Safety Foundation, March 1 and 22, 1946.



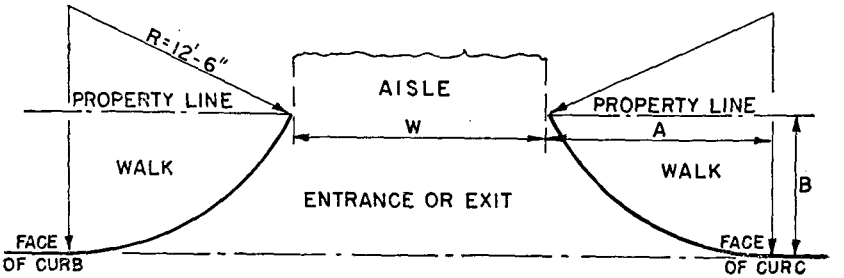
From the Traffic Engineering Handbook, National Conservation Bureau and Institute of Traffic Engineers, 1941

FIGURE 24—Eight Methods of Parking in a Rectangular Area



From the Traffic Engineering Handbook, National Conservation Bureau and Institute of Traffic Engineers, 1941

FIGURE 25—Two-way Entrance and Exit Design for Parking Lot



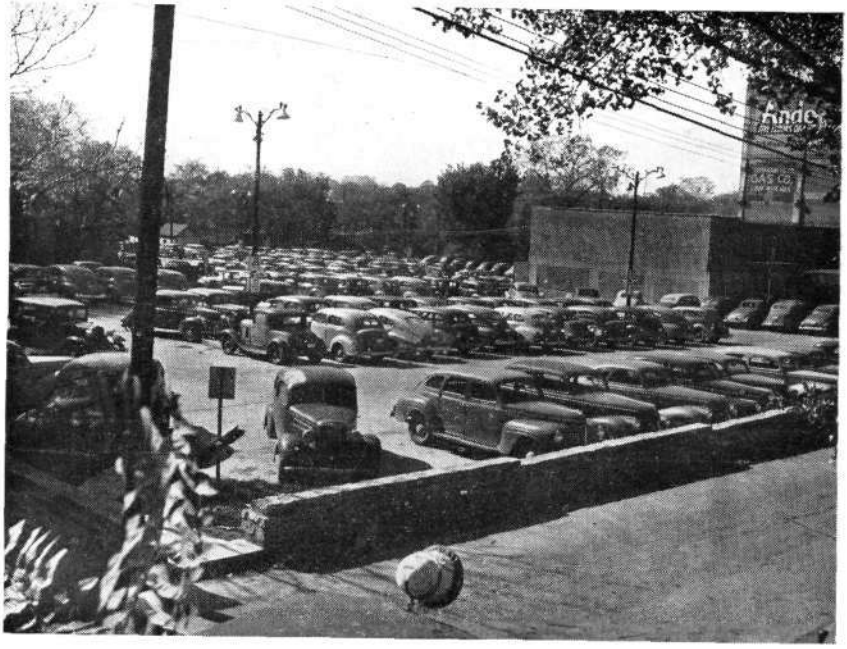
W = AISLE WIDTH OF PARKING LOT.
B = PROPERTY LINE TO FACE OF CURB.
A = SEE ABOVE DIAGRAM.

NOTE:- THE CURB RETURNS FOR ENTRANCES AND EXITS WERE SO DESIGNED AS TO PERMIT A CAR TRAVELING ONE FOOT FROM THE CURB, TO MAKE THE TURN INTO THE PARKING LOT AISLE AND MISS ANY PARKED CARS BY ONE FOOT. EXITS WERE DESIGNED FOR THE REVERSE OF THE SAME MOVEMENT.

A	B	EXIT W	ENTRANCE W
9'-9"	4'-6"	11'-6"	14'-9"
10'-6"	5'-6"	10'-9"	14'-0"
11'-0"	6'-6"	10'-0"	13'-6"
11'-6"	7'-6"	9'-6"	13'-0"
12'-0"	8'-6"	9'-3"	12'-6"
12'-3"	9'-6"	9'-0"	12'-3"
12'-4"	10'-6"	8'-9"	12'-2"
12'-5"	11'-6"	8'-6"	12'-1"
12'-6"	12'-6"	8' 3"	12'-0"

From the Traffic Engineering Handbook, National Conservation Bureau and Institute of Traffic Engineers, 1941

FIGURE 26—Minimum Entrance and Exit Curb Returns for Parking Lots



Courtesy City of Kansas City, Kansas.

FIGURE 27—Kansas City's New Parking Lots

Courtesy Downtown Merchants Parking Association, Oakland, California

FIGURE 28—Well Designed Parking Lot in Oakland, California

Open-air Garages

The open air type of parking garage is a relatively new development in the provision of off-street parking facilities. As the name implies, the open-air or open-deck garage refers to a garage building constructed without sidewalls. Cars are stored on each of the decks including the top deck which would be the roof of the ordinary type of building. This type of garage is basically one parking lot above the other with a solid low parapet around each deck. Access to upper floors is usually by ramps.

Cost of Construction—Construction costs of this type of parking facility are about one-third the cost of the enclosed garage. The Hecht Company Department Store garage in Washington, D. C., was built at a cost of $182 per car space. Another open-air garage was constructed in Pittsburgh at a cost of $225 per car space. These cost figures are exclusive of the cost of land and are pre-war figures.

From the standpoint of cost, which is the major factor, this type of structure offers one of the most acceptable solutions to the off-street parking problem. Where land costs are such that it is not economically feasible to park cars on ground level only, the open deck type of garage should be seriously considered.

The deck type of garage also offers economies in height. The distance between floors is ordinarily less than for other buildings or other garage buildings, the clearance often being not over eight feet. Where it is necessary to store trucks or other vehicles requiring greater clearance, the ground floor may be constructed to accommodate them.

It is possible to so design and construct the open-air type of garage that additional levels may be added as required.

Space per Car—Space per car in the deck type of parking garage is ordinarily not much greater than in the open parking lot, although there is some loss of space in ramps. The average number of square feet allotted to each car, including maneuvering space, on parking lots where cars are parked by attendants, is 180. For the open deck garage the figure should be about 200 square feet.

A fine example of an open-air garage is shown in Figure 29.

This shows the conventional open-deck, three-story construction installed by the Hecht Department Store in Washington, D. C.

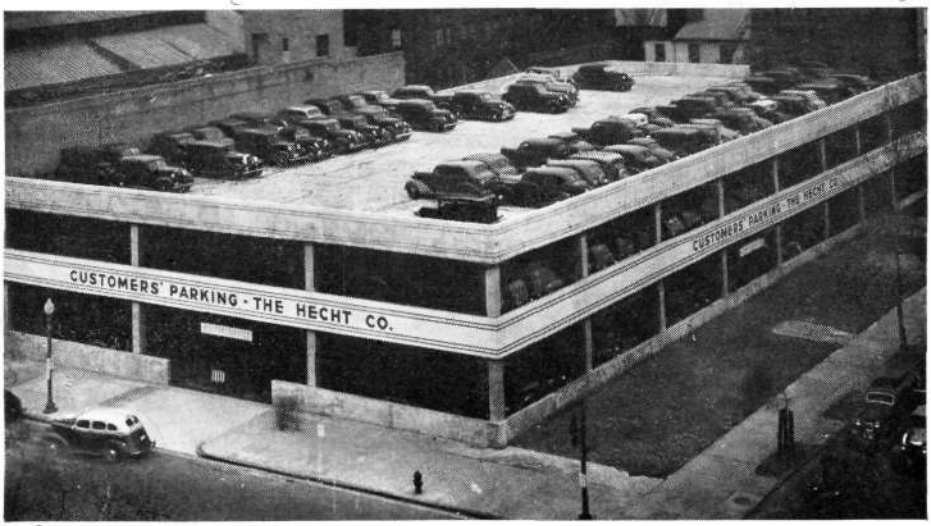


FIGURE 29—An example of an open-air garage, The Hecht Company, Washington, D. C.

A recent innovation in the construction of this type of garage building involves the use of ornamental concrete grill work to enclose the open space between decks or floors. In addition to serving an ornamental purpose, these grills have been found to give a more secure feeling to patrons of this type of garage. Figure 30 illustrates this type of grill work.

Combination Garage and Business Establishment—It may prove desirable from a business standpoint to combine parking facilities with other business establishments. A fine example of this may be seen in Figure 31 which shows the Stephen Girard Building in Philadelphia. Stores occupy the basement, first and second floors of the structure and the remainder of the building provides parking space for 600 cars. As many as 1,200 cars have used the facility in one day.[44]

Although built by the Board of Directors of City Trusts, the

[44]*News Report*, Automotive Safety Foundation, March 11, 1946.

From the paper: "What Can Be Done About Traffic Congestion?" F. W. Lovejoy, Civil Engineering Magazine, Volume 16, No. 5, May 1946

FIGURE 30—Open-Air Garage Showing the Use of Ornamental Grill Work to Enclose the Open Spaces Between Floors

Courtesy Board of Directors of City Trusts, Philadelphia, Pa.

FIGURE 31—Combination of Open-air Garage and Stores

project is managed on a private enterprise basis, even to the extent of paying taxes. Opened early in 1942, the structure replaced obsolete property, the earnings from which had depreciated to such an extent in the thirties that earnings were insufficient for taxes.

The board reports that the building has been a financial success—it returns a two-way profit in leases of stores and of the parking area to private operators—and it has stopped the drift of business away from the area in which it was built.

The City of Pittsburgh has a 500 car capacity parking garage on a city owned wharf. The charge for parking is fifteen cents per day.[23]

Enclosed Garages

The earliest parking garages were of the enclosed type. Generally they were high ceilinged and ornate, both inside and out. Many of these large garages were never operated at a profit until after one or more foreclosures, or until values had been written down to figures on which reasonable returns could be expected.

Construction Costs Vary—Construction costs of enclosed garages are variable. Comparatively few enclosed garages have been built during the past fifteen years. The ordinary type of enclosed garage will vary in construction cost anywhere from $500 to well over $1,000 per car space.

An example of a modern enclosed garage is shown in Figure 32.

Total Cost per Car Space for Different Facilities

The total cost per car space of providing off-street parking facilities is dependent upon two factors: land acquisition cost and the construction cost of whatever type of facility is to be provided. All of these costs vary widely. In order to obtain a relationship between the total investment costs per car space and varying land costs, the Committee on Parking and Terminal Facilities of the

[23] *Survey of Traffic Conditions in 24 of the Nation's Largest Cities.* Commerce and Industry Association of New York, Inc., December 1, 1945.

FIGURE 32—A Modern Enclosed Garage

American Automobile Association[6] conducted a survey in 1940 to determine the average cost of construction per car space for various types of parking facilities on land of varying values. At that time, construction costs of open-air garages were $200 per car space and of enclosed garages $500 per car space. These figures represent the average figures reported in reply to a questionnaire sent out in 1940 by the American Automobile Association Committee to various cities throughout the United States. Each car

[6]*Report of the Committee on Parking and Terminal Facilities*, American Automobile Association, 1940.

space was allotted 180 square feet for parking lots, open-air, and enclosed garages. Three story structures were assumed in the case of garages. From this study it was shown that in 1940 it cost less to provide parking space, insofar as total investment is concerned, in the open-air garage than on the parking lot when land costs are above $1.65 per square foot. Therefore, all other conditions being the same, it can be said that the use of land with a value in excess of $1.65 per square foot for parking lots was uneconomical. With current high construction costs, the land value would have to be higher than in 1940 to make garages more economical than parking lots. The American Automobile Association is now collecting representative data to revise their pre-war calculations in light of present day construction costs.

These values were applied to fifteen city blocks in the heart of New Haven, Connecticut, in a recent study and it was found that the use of street front property for parking lots within any of these city blocks could not be justified. However, as was mentioned previously, property located within the interior of these blocks was also studied and it was found that 60 per cent of these areas were capable of supporting parking lots.

It is essential that any city contemplating the development of parking facilities make a similar study of its local conditions in order to determine whether parking lots can be economically justified. Construction costs for such a study should be based upon costs in the locality at the time of the study. Today, these vary widely and rapidly.

Underground Parking

Another new method of providing off-street facilities in congested business districts is the use of the underground parking garage.

San Francisco partially met its parking problem by constructing between March 1941 and September 1942 a terminal under Union Square.[45] The Union Square garage was constructed at a cost of $1,500,000. Of this amount $850,000 was an RFC loan and

[45] *What Can Be Done About Traffic Congestion?* F. W. Lovejoy, Civil Engineering May 1946.

$600,000 was raised by public subscription. The city of San Francisco holds all common stock and will take title after proceeds of operation have retired preferred stock and the RFC loan. The garage has been leased for fifty years at a rental of $5,000 per year, but the lessee pays a yearly tax assessment of $15,000. The garage has a capacity of 1,700 cars, an average cost of about $880 per car space. It is estimated that this capacity of parked cars would fill the curb facilities of 108 city blocks or would be equal to a capacity of 50 miles of curb space. The garage is a four-story fireproof structure, 412.5 feet by 275 feet by 48 feet deep. The following parking rates prevail at the present time for the Union Square Garage.

One hour parking	25¢
Two hours	35¢
All day (12 hours)	50¢
24 Hour Parking	75¢
Monthly storage	$12.50
Monthly deluxe service (Dusting, 1 wash job, 1 lube job	$20.00

A plan has been advanced in Detroit for the construction of off-street parking space under Washington Boulevard. Boston, Massachusetts, and New Haven, Connecticut, are studying the possibilities of constructing parking facilities under their public greens. In Los Angeles, where the parking problem is acute, consideration is being given to constructing an underground garage under Pershing Square. Studies are being made of Los Angeles' present facilities and needs which it is believed will lead to a broad action program. Some of Washington's civic and government leaders believe that the city eventually will have to construct underground garages under portions of the Mall and under parks adjacent to the downtown business section.

The Union Square Garage in San Francisco is found in Figure 33. Still another example of underground parking is found in London, England. "Like San Francisco, London is going underneath a public park to provide parking space in congested areas. Detroit's plan for an area beneath a boulevard has reached the contract stage. The British have evolved dial-controlled, endless conveyors studded with car-sized plates which move up parking bays, make

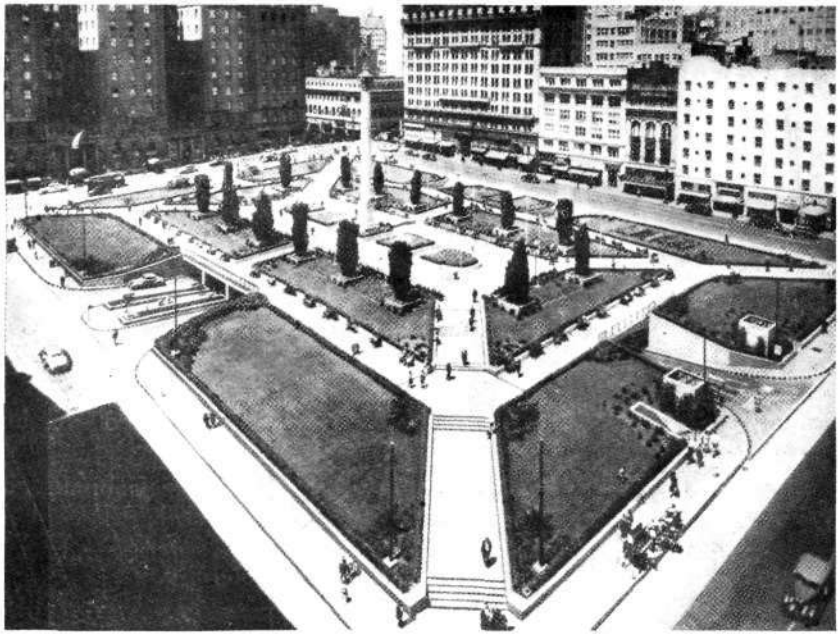


FIGURE 33—San Francisco's Undeground Parking Garage at Union Square

right-angle shifts across the ends, return to entrances. When a car is wanted, its belt position is dialed and the mechanism is set in motion, stopping when the car reaches the end of the bay. Since the main entrance-and-exit aisle is the only one needed, the system utilizes 79 per cent of the space against 39 per cent for non-mechanized areas."[46]

Underground parking plans for Philadelphia have been announced. "Plans for a double-decked parking area under Reyburn Plaza, adjoining City Hall, have been drawn by the Department of City Transit. The project, which would contain 6,200,000 square feet of service area with a 905-car capacity, would cost an estimated $1,850,000 to $2,000,000. Carrying charges would be met by parking fees and it is estimated that $120,000 yearly would more than cover interest and payments on principal."[47]

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[46]*Digging into the Parking Problem,* Business Week magazine, February 23, 1946.

[47]*New York Times,* July 14, 1946.

CHAPTER V

PARKING ON RURAL HIGHWAYS

Rural highways, as well as all others, present a parking problem. There are numerous reasons why drivers must stop or park on rural roads. Principal among them are:

1. Emergency stops—mechanical failures, tire failures, gas exhausted, detours or road blocks.
2. Business stops—school bus loading or unloading, commercial bus stops, rural mail delivery, road maintenance, traffic surveys, salesmen.
3. Pleasure or recreational stops—scenic views, picnics, drinking water, special interests, rests for drivers (commercial and private vehicles), special interests along route.
4. Miscellaneous stops—to check route or destination signs, accidents, arrests or enforced stops.

Normally on rural roads practically no provision is made for necessary parking. This creates a parking problem and contributes to accidents. It is not often that the amount of parking demand on a rural highway taxes the available space, so the demand characteristics and turnover are not as important as in congested areas. Vehicles improperly or illegally stopped and those parked on shoulders or along rural roadways are serious traffic hazards and means for accommodating and regulating them is a problem for officials.

Accidents

More Severe Than Urban Accidents

In view of unexpected exposures created by infrequent parking, a surprisingly large number of accidents in rural areas involve stalled and parked automobiles. Because of higher speeds, these

accidents are generally more severe than those involving parked cars in urban places. Statistics show the involvement of parked cars in as many as 7 to 13 per cent of rural accidents. Reports of the National Safety Council indicated 12 per cent in 1940 and about 9 per cent in 1944, when rural travel was low. A study made by Mr. W. W. Davis of rural accidents in twelve states, shows accidents involving parked or stopped vehicles to constitute 12.4 per cent of all rural accidents.[48]

A distribution of parking accidents on rural roads in twelve states in 1938 by type is shown in Table XIII. It will be noted that 37 per cent of these accidents involved properly parked cars, showing fault of operators of the moving cars in the collisions. Thirty-one per cent of the accidents involved cars stopped in the traffic lane and an additional 18 per cent involved cars slowing or stopping in traffic lanes.

TABLE XIII[48]

PARKING ACCIDENTS ON RURAL ROADS
Summary for 12 States

TYPE	NUMBER	PERCENTAGE OF PARKING ACCIDENTS	PERCENTAGE* OF ALL ACCIDENTS
1. Slowing down or stopping	1,551	18.2	2.3
2. Properly parked	3,182	37.2	4.6
3. Stopped in traffic lane	2,635	30.9	3.8
4. Starting out of parking place	183	2.1	0.3
5. Backing out of parking place	494	5.8	0.7
6. Pedestrian vs. parked car	477	5.6	0.7
Total	5,161	100.0	12.4

*Parking accidents taken as 12.4 per cent of all accidents.

Many stops in or along roadways in rural areas are of an emergency character. A number of collisions take place with these vehicles and actions by drivers in attempting to avert collisions

[48] *Accidents on Rural Highways Due to Parking*, Wilfred W. Davis, thesis submitted Bureau of Highway Traffic, 1940.

with the stalled cars often result in other types of collisions. A study made by the Interstate Commerce Commission for 1945 shows that one-fourth of the mechanical defect accidents involving vehicles engaged in interstate commerce were due to vehicles colliding with other vehicles which were disabled. Of all interstate motor-carrier accidents in 1945, 2.7 per cent involved vehicles which were stopped because of mechanical failures.[49]

Accident Data Not Uniform

Differences in accident reporting procedures of various states make it difficult to gather comparable data on parking accidents. There are sufficient facts, however, to indicate that parking accidents are a significant portion of the problem of safety on rural highways. They are probably a source of more trouble than many accident reports indicate.

High speeds make parking and stopping on the paved or traveled portion of any roadway particularly hazardous, yet on many roads either there are not adequate shoulders, or physical obstructions make clearance of travel lanes impossible.

Controls and Regulations

Uniform Code

The Uniform Traffic Codes recommend state regulations prohibiting the parking of vehicles on the traveled portion of roadways:

> Stopping, standing, or parking outside of business or residence districts.—(a) Upon any highway outside of a business or residence district no person shall stop, park, or leave standing any vehicle, whether attended or unattended, upon the paved or main-traveled part of the highway when it is practical to stop, park, or so leave such vehicle off such part of said highway, but in every event an unobstructed width of the highway opposite a standing vehicle shall be left for the free passage of other vehicles and a clear view of such stopped vehicle shall be available from a distance of 200 feet in each direction upon such highway.

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[49] *Analysis of Mechanical Defect Accidents of Motor Carriers*, 1945. Interstate Commerce Commission, August, 1946.

(b) This section shall not apply to the driver of any vehicle which is disabled while on the paved or main-traveled portion of a highway in such manner and to such extent that it is impossible to avoid stopping and temporarily leaving such disabled vehicle in such position.[18]

Trucks, passenger buses, and truck trailer combinations are covered by special regulations requiring them to carry and use flags, flares, fuzees or lanterns when it is necessary for them to stop in the traveled portion of the roadway. Requirements for interstate vehicles are covered by the Interstate Commerce Commission. Requirements for other vehicles are recommended in Article XVI, Section 158 of Act V of the Uniform Motor Vehicle Code. Similar requirements might well be made applicable to passenger vehicles.

School Buses

School buses present a problem on rural roads. For protection of the children, most states now have laws which require all other vehicles to stop while the buses are loading or unloading—many apply the regulation to vehicles traveling in both directions. Many privileges taken by the school buses, such as unnecessary stops, stops at points of restricted sight distance, use of buses to transport persons other than school children, make these regulations difficult to enforce. Enforced or not, the buses create hazards on rural roads, much the same as any other vehicle stopped on the traveled lanes.

There should be few exceptions to regulations requiring school buses to stop off the traveled roadway. They should be required to stop on shoulders, in driveways, at intersections and other off-roadway locations; where these do not exist provisions should be made. The hazard of a stalled or stopped vehicle would then be removed and the law requiring motorists approaching the stopped buses would still protect the children who might dash from behind the bus onto the roadway. The provision of adequate sidings or special turnouts would do much to correct the bad conditions

[18] *Uniform Act Regulating Traffic on Highways*, Public Roads Administration, Federal Works Agency, Government Printing Office.

created by school buses stopping in the roadway, both for children and the motoring public.

Regulations should be created in every state to prohibit intercity buses from making promiscuous halts on the roadway to take on or discharge passengers. Where they cannot pull off the roadway onto the shoulder for such purposes, they should be required to go into an intersection or to such place where the stop can be made off the traveled roadway.

Roadway Influences

Many design features of rural roadways have a direct influence on the stopping and parking of vehicles. In most cases, accident and traffic facts are not available to prove the degree of the hazard, but nevertheless many of the deficiencies are due to improper design.

Curbs

Curbs on the outside of rural roadways, usually aimed at improving drainage and preventing shoulder rutting and erosion, discourage motorists from driving off the traveled portion of the road.

Figure 34 shows a typical section of roadway with curbs on each side of the pavement which discourage use of shoulders even where shoulders are adequate. Even though the curbs may be battered or of the lip type and low, with inviting shoulders adjacent, people object to driving over the curbs. This objection is especially pronounced in cases of tire failures where motorists are anxious to damage the flat tire as little as possible. In cases of motor failures, coasting vehicles may not have sufficient momentum to carry over the curbs after the failure has been finally acknowledged by the driver. Accident experiences involving parked and stalled cars have been particularly bad on rural roadways with curbs on the right edges of the pavements. (The Eno Foundation is currently engaged in a study to ascertain the relative hazard of rural roadways with and without curbs on the outside edges.) With high speeds, shoulders should partially serve as acceleration and deceleration lanes. Such will not be the case on pavement encased in curbs.

FIGURE 34—Curbs on each side of pavement discourage use of shoulders

Shoulders

To reduce costs, many miles of rural roads have been constructed without shoulders adequate to accommodate a stopped automobile, not to mention a large truck. Most of these are two-lane roads, thus creating a condition where a vehicle stopped by choice or by necessity cannot leave adequate clearance for the passage of two other vehicles.

Unfortunately, many of the roads with inadequate shoulders are those with the heaviest volumes of traffic because of their choice for early surfacing in road improvement programs. On many of these old, yet important routes, the problem is further complicated by narrow right-of-way which was considered adequate when obtained.

Each state should make a study of accidents on roads without adequate shoulders and should take steps to remedy conditions at most locations. It is frequently found that shoulders are not provided on roadways where grading is heaviest. As a rule, alignments

are also poorer in such regions, thus causing especially dangerous conditions when vehicles are stopped. Night accidents are apt to be particularly serious, especially on routes with appreciable truck traffic.

Condition of Shoulders Important—The condition of shoulders is also important. Unsodded and poorly surfaced shoulders will not attract motorists desiring to park or forced to stop. To have shoulders used properly, it is necessary to keep them attractive and in good repair. In order to be adequate, shoulders should be able to support a vehicle in all weather conditions.

The hazardous conditions created by inadequate shoulders are now recognized by federal, state and local officials and all new construction will provide off-the-road space. Shoulders of ten feet or greater width are now dominant on new primary or high type roads. Until all roads can be so developed, conditions should be alleviated by constructing turnouts, by signing, and by enforcement of stopping and standing regulations.

Turnouts

The importance of constructing frequent turnouts along rural roads, which do not have adequate shoulders, was just discussed. Such turnouts, when properly located and designed, will do much to reduce the hazard of parking on rural highways at the following locations:

1. Bus stop—suburban, intercity and school buses.
2. Scenic locations.
3. Roadside parks.
4. Steep upgrades—for trucks.
5. Causeways.
6. Adjacent to long bridges and tunnels.
7. Truck rests.

Attractive facilities along rural roads will attract motorists and remove vehicles from the traveled roadway. Measured in terms of accident reduction and pleasure to the public, such facilities can be justified at many locations along important routes.

Guardrails

Care should be taken to erect guardrails so that a vehicle may be stopped between the rail and the edge of the pavement. For no apparent necessity, guardrails have been erected along some highways with not more than three or four feet of space between the rail and the road. This is inviting trouble and is apt to cause more serious accidents between stopped and moving vehicles than the prevention of "off-roadway" accidents by the erection of the guardrail.

Roadside Establishments—Control of Access

Dangers of Unregulated Parking

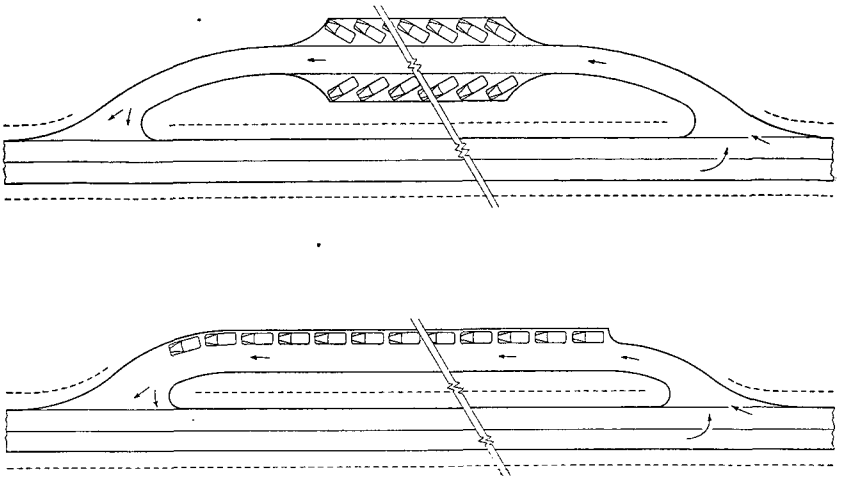
Unregulated parking along the highway at stores, stands and at other suburban and rural businesses causes many difficulties. Access legislation is perhaps the best control over such conditions, as it limits the free or unrestricted entry of vehicles to a highway. This being unavailable in most states, it is necessary to achieve the best possible control over parking and vehicle entry through permits which require properly designed entrance and exit points to adequate off roadway parking areas.

In some states without adequate limited access legislation, highway officials are attempting to incorporate "right of entry" clauses in property deeds when right-of-way is purchased. In some places, makeshift controls are achieved by erecting guardrails in front of the roadside establishments so as to limit and control access points. These procedures prove the seriousness of promiscuous parking and access along rural roads and show the need for adequate control.

Encourage Off-Roadway Parking Lots

Wherever possible, roadside business should be encouraged (if it cannot be forced) to provide adequate and attractive off-roadway parking lots. Such lots should be thoroughly insulated from the highway and should be entered and left by well designed and marked driveways. They should be designed to discourage patrons from parking on through traffic lanes and on highway frontages

for uncontrolled entrance and exit. Two simple types of traffic parking areas are shown in Figure 35.[50]



TYPICAL OFF-ROAD PARKING FACILITIES

From: "A Policy on Highway Types," American Association of State Highway Officials, 1945

FIGURE 35—Typical Off-Road Parking Facilities

An effective means of improving bad parking conditions on rural roads and arterial streets is to remove the parking attractions. By removing or eliminating business or establishments which create an urge to park through "strip zoning," many unsatisfactory situations can be improved. While not generally used, strip zoning has been proven a feasible and valuable aid to controlling roadside use. Its application should be investigated and carefully considered by state and county officials.

Road maintenance, reconstruction, and other road repair activities should be regulated so as to create a minimum hazard to motorists from the stopping of repair and maintenance vehicles on the roadway. The need for adequate signing and lighting cannot be overemphasized for such conditions. Public officials have a responsibility to remove such hazards.

[50] *A Policy on Highway Types*, American Association of State Highway Officials, 1945.

Enforcement

Inadequate Police Coverage

The enforcement of parking prohibitions and regulations in rural areas is more difficult than in cities because of the infrequent coverage of highways by patrolmen. It is advisable to guide the enforcement program in such instances by assigning officers to areas where parking accidents are most common, based on previous accident experience. Such enforcement procedure is applicable, of course, to all types of violations, and enforcement of the regulation is apt to eliminate or reduce violations of other regulations.

Publicize Accidents

Due to inadequate police coverage of rural highways, it is important to develop public support of parking regulations. Publicizing the accidents involving parked or stalled vehicles can do much to make motorists conscious of the hazards created by improper parking. Other publicity and advertisement programs can further acquaint people with the dangers of stopping autos on the roadway or of improperly parking cars along the roadway. Appropriate penalties for violations will do much to make motorists obey regulations.

Adequate Facilities Make Regulations Self-Enforcing

Again, it must be emphasized that parking regulations on rural roads become largely self-enforcing if adequate facilities are provided, so that motorists can easily get off the traveled roadway. Many drivers who know the hazard of parking on the pavement are forced to do so because there are no places along the roadway to park.

Close enforcement at night on unlighted rural roads is especially important to avoid collisions with stalled and improperly parked cars.

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