Shopping Center Parking Requirements

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This paper reports on research work carried out for the Urban Land Institute to establish the parking standards that should be used in the design of shopping centers.

An examination of the demand for parking facilities at 270 centers throughout the United States and Canada was undertaken. The research has shown that there are many factors involved in establishing these standards, such as parking habits, trading area, mode of travel, and the presence of nonretail uses in the shopping centers.

This research pointed out that at a shopping center where there is little walk-in or transit trade 5.5 spaces per 1000 square feet of gross leasable area will accommodate customer and employee parking demands on all but the three highest days of the year, with allowance for parking maneuvering. This is considerably lower than most zoning ordinances in effect throughout the country today.

The purpose of this research project was to investigate the demand for parking facilities at existing shopping centers and, on the basis of these observations to establish parking standards to be used in the design of shopping centers. These standards are to reflect the present consumer shopping habits and owner operational practices at shopping centers in the United States and Canada.

•THE RESEARCH program that was undertaken to evaluate parking standards was done in two phases. A pilot study, completed in 1963, was used to guide the establishment of the technique for a primary survey of 270 shopping centers carried out in 1964. Both of these program phases were undertaken by the Urban Land Institute with the assistance of the International Council of Shopping Centers, Inc. The Council obtained the cooperation of all the centers that were contacted and made it possible to get returns from a wide sample of shopping centers.

THE PILOT STUDY

The pilot study was primarily exploratory in nature and was conducted in 21 centers. Automobile arrivals and departures during every hour at each shopping center were counted by shopping center personnel or by pneumatic counters on a weekday (usually December 14) and on a Saturday (usually December 17). Aerial photographs taken between 11:00 a. m. and 3:00 p. m. provided a check on the reasonableness of peak-hour parking counts. An analysis of accumulation, arrival, and departure patterns of customers that was derived from the pilot study indicated that the peak parking demand occurred at about 2:30 in the afternoon or about 8:00 in the evening. Thus, in designing the primary study, it was decided to limit the counting of cars parked to those two hours on the 12 days before Christmas.

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TABLE 1

DISTRIBUTION OF SELECTED CENTERS
BY METROPOLITAN POPULATION AND CENTER SIZE

Metropolitan Population	Gross Leasable Area in Thousands of Square Feet						
	Under 100	100-200	200-400	400-600	600-1000	Over 1000	Total
Less than 250,000	9	29	16	3	2	—	59
250,000-500,000	8	12	10	7	2	—	39
500,000-1,000,000	10	10	13	8	2	—	43
1,000,000-2,000,000	18	11	18	5	13	3	68
Over 2,000,000	11	12	21	9	6	2	61
Total number of centers	56	74	78	32	25	5	270
Percent of total	21	27	29	12	9	2	100

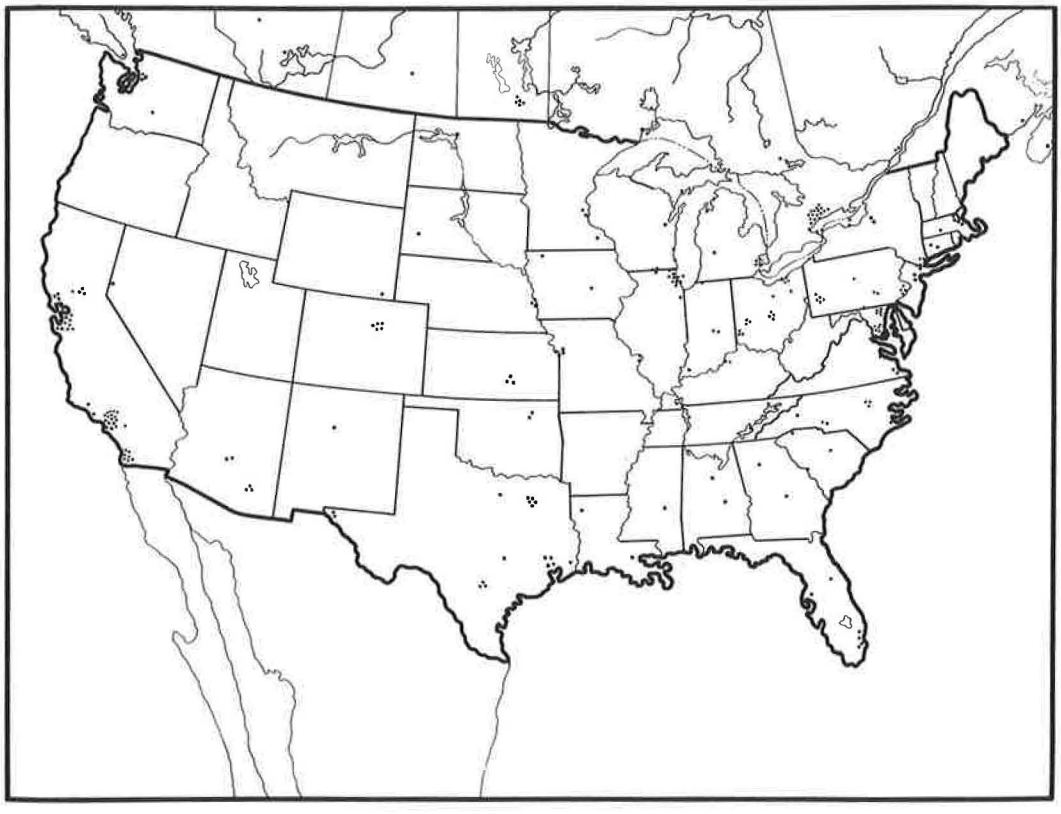

Figure 1. Geographic distribution of shopping centers.

THE PRIMARY SURVEY

A manual was prepared to describe the procedure necessary to systematically count the parked vehicles during the 12 pre-Christmas days (Appendix B). This manual was used to assure that the data would be uniform and comparable. With accompanying questionnaires, it was sent to shopping centers which represented different metropolitan area population sizes, different center sizes, different geographical areas, different consumer incomes, and different shopping center tenants. The larger metropolitan areas to be represented were selected from different geographical areas and climates, and several centers of varying size were contacted in each area. In addition to the

numbers of parked vehicles at 2:30 and 8:00, the following information was obtained for each shopping center in the primary study: (a) gross leasable area, (b) occupied floor area, (c) activities in the center, (d) available parking spaces, (e) spaces used by employees, (f) annual sales, (g) type of customers, and (h) age of center.

Sample for Primary Study

Questionnaire returns were obtained from 270 shopping centers. Table 1 summarizes the response on the basis of the population of the metropolitan area and the size of the center. Each population and size class appears well represented.

The 270 shopping centers which responded are widely distributed throughout the United States and Canada (Fig. 1). The San Francisco-Oakland, Chicago, and Toronto metropolitan areas are represented by more than ten centers each; and the Boston, Pittsburgh, Washinton, D. C., San Diego, Baltimore, and Houston metropolitan areas by more than five centers each. There are about 50 metropolitan areas represented in the less-than-250,000 population class, 25 in the 250,000-500,000 population class, 19 in the 500,000-1,000,000 population class, 16 in the 1,000,000-2,000,000 class, and 10 in the over-2,000,000 class.

PARKING PATTERNS AND THEIR IMPLICATIONS FOR A ZONING STANDARD

Daily Parking Patterns

The most important observation made during the pilot study was that, on the busiest day, shoppers tended to spread their shopping trips across the entire day. This is shown in Figure 2, which compares the peak day with a normal day during the Christmas season. Peak day trips are dispersed throughout the day, while on the other day they are concentrated into a shorter period of time. The difference between the peak parking volumes on the two days is very small, even though more than twice as many cars were

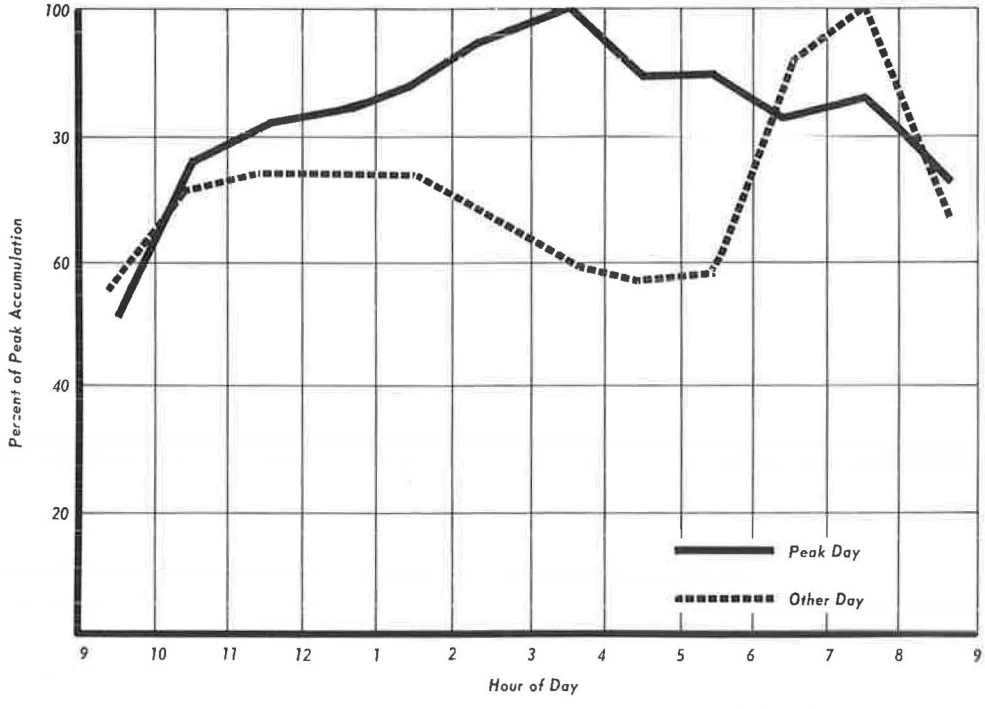

Figure 2. Accumulation pattern on peak and other days at a typical shopping center.

parked on the peak day as on the other. Some of the difference in the shapes of the parking demand curves can be shown to be the result of the normal differences between weekday and Saturday parking patterns; but there is, nonetheless, a consistent pattern of increased dispersion of trips on the peak day. Such a pattern makes it quite apparent that people do adjust their habits to avoid peak conditions and that any reasonable parking standards should take this into consideration.

Derivation of Yearly Parking Patterns

From the survey's data on parking space provision and its usage at peak hours, it was possible to derive the number of days during a year when these levels are apt to reoccur.

1. An analysis of shopping center traffic and parking, using data from eight of the centers in the pilot study, indicated that there is a strong relationship between daily inbound traffic volumes and peak-hour parking accumulation. This finding was confirmed by the study that Cleveland and Mueller had conducted for 14 other centers (1 Appendix, Fig. 40). Investigation of daily inbound traffic volumes and peak-hour parking demands for each of the 12 pre-Christmas days studied, using rank-order correlation techniques, further confirmed this relationship.

2. Recognizing this correlation, an investigation was made of the daily inbound traffic volumes at the same shopping center over a 2-yr period. This investigation indicated that of the 12 shopping days before Christmas, the four highest were never equaled during the entire year. However, each of the fifth- through the eighth-highest days of traffic volume before Christmas was duplicated at other times throughout the year, and each of the ninth- through twelfth-highest days of traffic volume was duplicated twice throughout the year. The same patterns should occur in peak-hour parking demands, since a strong relationship exists between them and daily traffic volumes. Thus, it was possible from this analysis to relate the observations that were made for the peak hours of the peak days in the Christmas period to a yearly pattern.

To estimate the equivalents of the third-highest day or sixth-highest day in the more conventional engineering terminology of highest-hours, additional analysis of the shopping center data on traffic volumes was carried out which indicated that the third-highest day of the year and the tenth-highest hour of the year are approximately equivalent. Similarly, the sixth-highest day was comparable to the thirtieth-highest hour so often used in highway engineering standards. When this pattern was compared to the annual hourly traffic volume pattern at the shopping center described in the Cleveland-Mueller report, the two were found to be very similar (1, Fig. 48).

Determination of Parking Requirements

In establishing a standard to guide the amount of parking to be provided at a shopping center, it must be recognized that, if extremely high peak parking demands occur only two or three days a year, it is unreasonable and uneconomical to provide facilities to fully accommodate them (Fig. 3). Therefore, determination of the number of parking spaces that should be provided by a shopping center is a problem analogous to highway design problems, which are generally solved by the provision of facilities to meet the thirtieth-highest hour of traffic volume (2).

A similar analysis was made of the shopping centers in the sample by estimating the frequency of occurrence of each peak-hour parking demand level in all of the centers combined, during the entire year, as previously described. The parking demand was expressed in "spaces used by customers and employees per 1000 square feet of the gross leasable area that was occupied." By ranking these observations from the highest to the lowest, it was possible to determine the level of parking demands on the second- or fourth- or sixth-highest days of the year at all of these centers combined. The result for 103 centers without theater or office space is shown in Figure 3. The vertical scale in the figure represents use of parking spaces at the various shopping centers. The horizontal scale shows the number of days during the year when the parking demand was greater than that shown by the use curves as derived from the

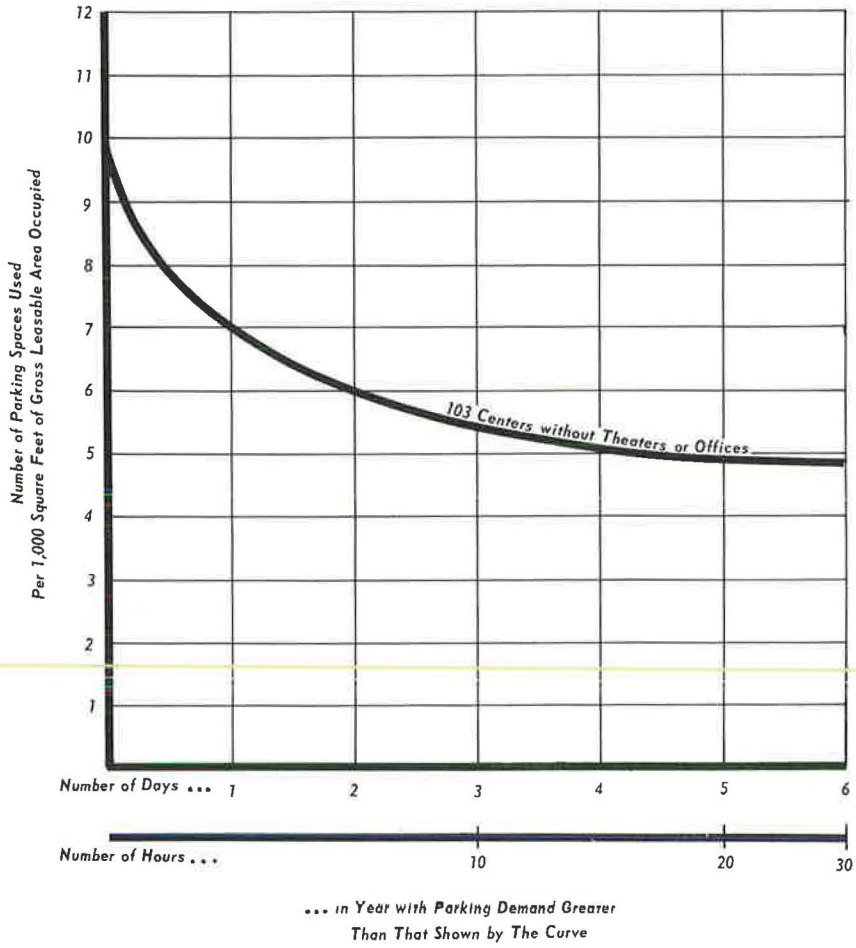

Figure 3. Daily parking requirements.

basic data. The chart shows that parking demand exceeds six spaces per 1000 square feet on only two days of the year and 5. 5 spaces per 1000 square feet on three days of the year.

To the extent that this sample is representative of all shopping centers in the United States and Canada, the same levels of parking usage can be expected at all shopping centers, and the standard described herein will be applicable to them.

If the highway officials' thirtieth-highest hour design criterion were used to determine parking requirements at shopping centers, about 4. 9 spaces per 1000 square feet of gross leasable area would be required. Comparison of hourly and daily parking demands by the special analysis of traffic data for a shopping center (described above) indicates that the thirtieth-highest hour of parking demands is roughly equivalent to the sixth-highest day (Fig. 3).

Perhaps a more realistic standard in light of customers' desires would be the selection of the third-highest day as a basis for a parking standard. This is logical because, as shown by Figure 3, the curve levels off after the third-highest day. Such a standard would eliminate the extremely high peaks which occur on the first-, second-, and third-highest days. This would mean that for each space not provided (between this standard and one which would require an additional space per 1000 square feet) about ten auto customers in a year would be unable to find a parking space immediately, since the

third-highest day is approximately equivalent to the tenth-highest hour (the average customer stays at a typical center for about an hour) (1, Figs. 41-43; 3).

From an economic point of view, such a standard is very conservative since the annual cost of providing a parking space in a shopping center greatly exceeds the profit revenue from the sales volume that ten customers would generate.

If the design hour were selected solely from an economic point of view, that is, considering the shopping center developer's annual cost of providing parking ($100 per space) and the possible economic return on such money ($2 to $3 per vehicle parking), the design hour would probably be between the thirtieth- and fiftieth-highest hours. These estimates of the annual cost of providing parking and the economic return per vehicle parking are subject to judgment but, even if the most optimistic cost estimates are used, provision of parking to meet the tenth-highest hour of parking demand will be more than adequate to meet the economic criteria.

The Recommended Standard

As shown by Figure 3, provision of parking spaces at a level which would exclude the third-highest day of demand requires approximately 5. 5 spaces per 1000 square feet of gross leasable area (exclusive of theater or office space). This includes parking spaces required by employees, as well as the reserve spaces needed for parking maneuvering. The counting technique took into account the spaces needed for parking maneuvering by: (a) considering a space occupied if a car were pulling in or out of it, (b) considering a car as filling an empty space somewhere else if it were waiting to pull into a space, and (c) considering a car as filling a space somewhere else if it were parked in an illegal space. (See Appendix B for a more detailed description of the counting technique.)

Thus, a total of 5. 5 spaces per 1000 square feet of gross leasable area (exclusive of theater and office space) is recommended as the parking standard for the design of shopping centers of all sizes. To the extent that the centers in this sample are like those in the United States as a whole, Figure 3 shows that this standard, on the average, will satisfy the parking demands for all but three days of the year at all of the shopping centers in the United States. This is approximately one percent of the total days these shopping centers are open during a year.

Additional analysis of the 103 centers that had no theater or office space indicates that they had the same demand on the third-highest day regardless of their size. The number of spaces used on the third-highest day by the centers in all size classes actually varied between 5. 0 and 6. 0, but there was no systematic relationship between the center size and the parking demand; so it is possible to recommend a single standard of 5. 5 spaces per 1000 square feet for centers of all sizes. The parking demands of only one size class (composed of those nine centers with between 400,000 and 600,000 square feet of gross leasable area) differed from the recommended standard by more than 0. 25 spaces per 1000 square feet, so the variations by size class were generally insignificant. The lack of a systematic relationship between parking demand and shopping center size is shown by the fact that there was only 0. 2 spaces difference between the parking demands of the largest and smallest size classes.

The test of any standard is in its application. Of the 103 centers that were studied, eight centers provided spaces at the recommended level of 5. 5 spaces per 1000 square feet of gross leasable area. The parking demand at these centers, as shown by Figure 4, exceeds capacity for only three days of the year—that is, during those days cars are parked illegally and queuing occurs within the center. Figure 4 also indicates that at the sixth-highest day (the standard equivalent to that used by highway engineers in the design of highway facilities, as mentioned above) the centers have a parking reserve of at least ten percent.

Parking demands on the third-highest day at those centers providing 6. 0 spaces per 1000 square feet of gross leasable area are very little more than at the centers providing 5. 5 spaces per 1000 square feet.

Figure 4 also shows the number of spaces used per 1000 square feet of the gross leasable floor area that was occupied at centers that provided, on the average, 8. 8

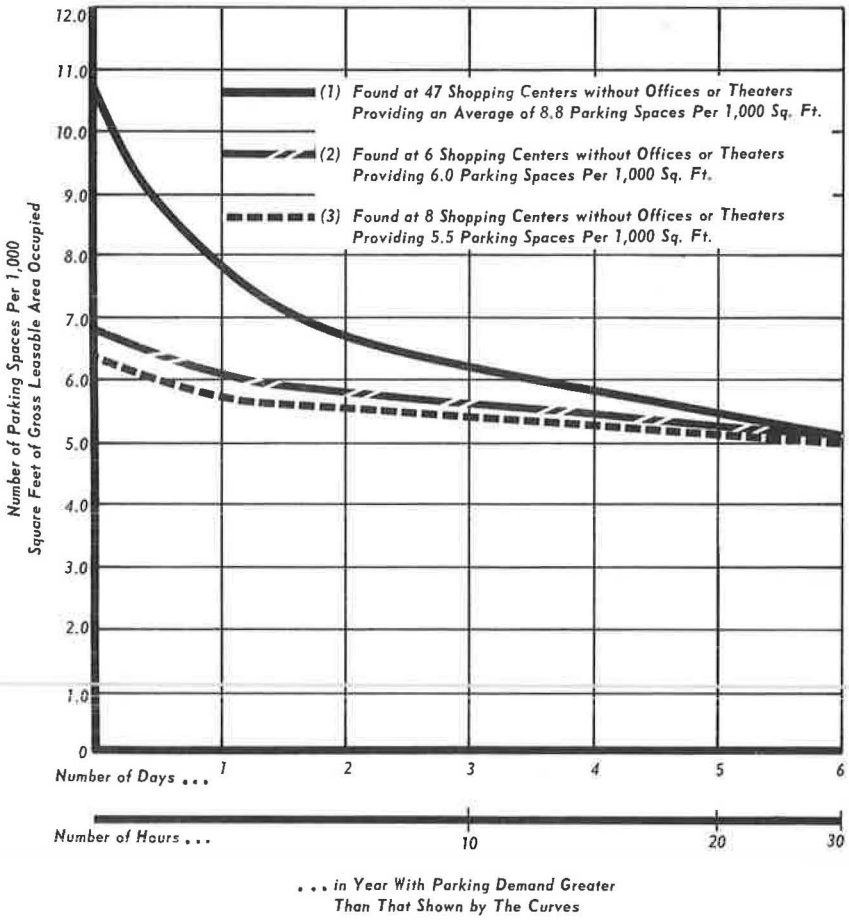

Figure 4. Daily parking requirements.

spaces per 1000 square feet of gross leasable area. In these cases, the additional spaces above the recommended standard were used to some degree for the six highest days, but they only served about 30 extra cars per 1000 square feet, and after the sixth-highest day were not used at all. In other words, when about nine parking spaces per 1000 square feet of gross leasable floor area are provided, the additional spaces over the recommended standard are used only six days a year, mainly on one or two days.

Thus, the recommended standard is one that takes into consideration the customer, but at the same time recognizes that sound planning should not provide for the infrequent extremes in the peaks of parking demand.

Using this technique on data from 103 shopping centers for the 12 days of the pre-Christmas season has probably provided a reliable estimate of parking demand levels and their frequencies during the highest three days of the year (Fig. 3), since the four highest days occur during the Christmas season. This is the portion of the curve which is most reliable and on which the recommended standard for parking space provision is based. Equally reliable estimates of the frequencies of the lower parking demand levels would require more parking counts on more "normal" days, but such estimates are unnecessary for justification of the recommended standard. This, then, is a standard based on observed parking demands at the peak hours of the peak days of the peak season of the year.

SPECIAL CIRCUMSTANCES MODIFYING PARKING REQUIREMENTS

Parking demands are not generated by the building space itself, but by the clientele of the center—which is determined by the location of the center, its competitive advantage, the characteristics of the trading area's population and its mode of transportation, and by the number and types of activities located in the center.

Effects of Shopping Center Location and Trading Area on Parking Requirements

Parking requirements at a shopping center are affected by the location of the center. For example, if a center is located near a physical barrier, such as a body of water or undevelopable open space, fewer shoppers can be attracted from one direction than if the center were located in an area which is easily accessible from all directions. In Figure 5, Shopping Center Number 4 illustrates this. In such cases, the parking requirements probably could be below the recommended standard.

Numerous studies in the past have indicated that the trading area of a shopping center is also affected by the location of competition and the size of the center itself. These factors are also clearly shown by Figure 5, which shows the points from which shoppers came to various shopping centers in Seattle. The size of the trading area of each center varies with the size of the center, but the influence of competing centers modifies these trading areas, as in the case of Shopping Center Number 3.

Thus, there may be instances where a shopping center, because of unique location, would have higher or lower parking requirements than indicated by the recommended standard. Where such conditions are not likely to change with time, modification of the

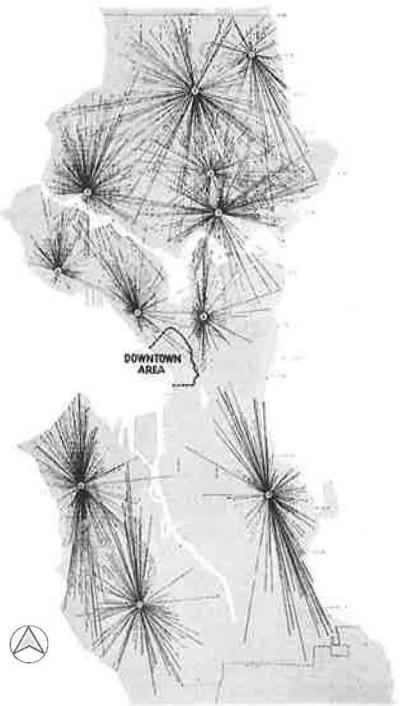

Figure 5. Trading areas of shopping centers in Seattle.

standard is in order. In such circumstances a specialized study should be undertaken to establish the parking requirements. In the case of a proposed center, this would call for the application of a mathematical model that adequately simulates shopping patterns. Where an existing shopping center is to be expanded, analyses of existing parking practices and a study of projected parking requirements should be undertaken before such modifications can be considered.

Effects of Mode of Travel on Parking Requirements

The data for the shopping centers included in this study show the characteristics of their suburban locations and, as is typical of such outlying areas, the elements of walk-in trade and dependence on public transportation are missing. The customers arrive principally by private automobile. Suburban shopping centers have the greatest parking demands per unit of gross leasable floor area. Where a shopping center (or a shopping district) is located in a central city area served by mass transportation and where a high volume of walk-in trade comes from the surrounding neighborhoods, the parking requirements are reduced by as much as two-thirds from those found in suburban areas. This finding comes from a traffic engineering survey of parking demand in the Baltimore metropolitan area. (This information comes from a special investigation of data developed in connection with the market potential and site evaluation studies on multi-purpose centers for the Baltimore region by Alan M. Voorhees and Associates, Inc.) Similar reductions in parking requirements for retail shopping districts have been observed from comparable parking demand studies conducted in Detroit (4).

Since the recommended parking standards are for a center with little walk-in trade or transit usage, an increase in the importance of either of these factors would call for a corresponding reduction in parking requirements.

Effects of Tenant Composition on Parking Requirements

The recommended parking standard might be modified if the array of shopping center tenants were unusual. For example, if the center's tenant composition were to include furniture stores or other such specialty tenant classifications, the parking requirement could be reduced, since such stores generally do not generate the parking requirements that are normally observed at shopping centers with predominantly apparel, drug, variety, hardware, and food stores and services (3, Table 5; 5, Table 14).

Effects of Offices and Theaters on Parking Requirements

The 270 shopping centers in this study reported the floor area, if any, devoted to office use. An analysis was made to determine what impact the office use might have on parking requirements at the peak hours of the third-highest day. It was found that office floor area was not a significant predictor of parking space demand in regression analysis.

Office space does not generally have an impact on peak-hour parking requirements at the third-highest day because when this peak hour occurs offices are not normally open. For example, at the centers in the sample only 13 percent of the peak demands on the third-highest day occurred when the offices were in full operation. These peak demands usually occurred on evenings, Saturdays, or the day before Christmas when, generally, office activities were below normal.

Generally, it was found that normal hours of office operation only began to coincide with the peak hours occurring on the sixth-highest day of parking demand. Figure 3 shows that there is a difference of one-half space per 1000 square feet (of the gross leasable area that was occupied) between the peak parking demands on the third-highest day and the sixth-highest day. This number of spaces would accommodate normally about the parking requirement for 200 square feet of office space, assuming that 2. 5 spaces per 1000 square feet of office space use are adequate to satisfy normal office parking requirements in shopping centers. This means that for every 1000 square feet of gross leasable area at a shopping center an additional 200 square feet in office use may exist without increasing parking demand for the third-highest day. Thus, if up to

20 percent of the gross leasable area of the center is in office space the center's parking requirement based solely on gross leasable area is adequate. When more than 20 percent of the gross leasable area of the center is in office use, provision should be made for office parking according to the generally accepted standard of 2. 5 spaces per 1000 square feet in office use.

It is possible that those centers which have large concentrations of offices with tenants such as doctors and dentists, who serve the public directly and may have extra demands during Christmas vacations, would generate enough parking demands at the tenth-highest hour to require more than 5. 5 spaces per 1000 square feet, but these effects were not observed in the present study.

An analysis of the impact that theaters may have on parking requirements at shopping centers was also undertaken. Although statistically significant results were obtained by multiple regression techniques, indicating that the presence of a theater in a shopping center generates additional parking demand, it was felt that in light of the sample size (only 28 shopping centers had theaters) and the dominance of retailing activities at the centers studied, additional research should be undertaken. Appropriate research should analyze the nature of parking demand generated by a theater at a shopping center by determining: (a) the extent to which theaters have a multiplier effect on retail parking demands, (b) the interchange of parking spaces between theater and retail

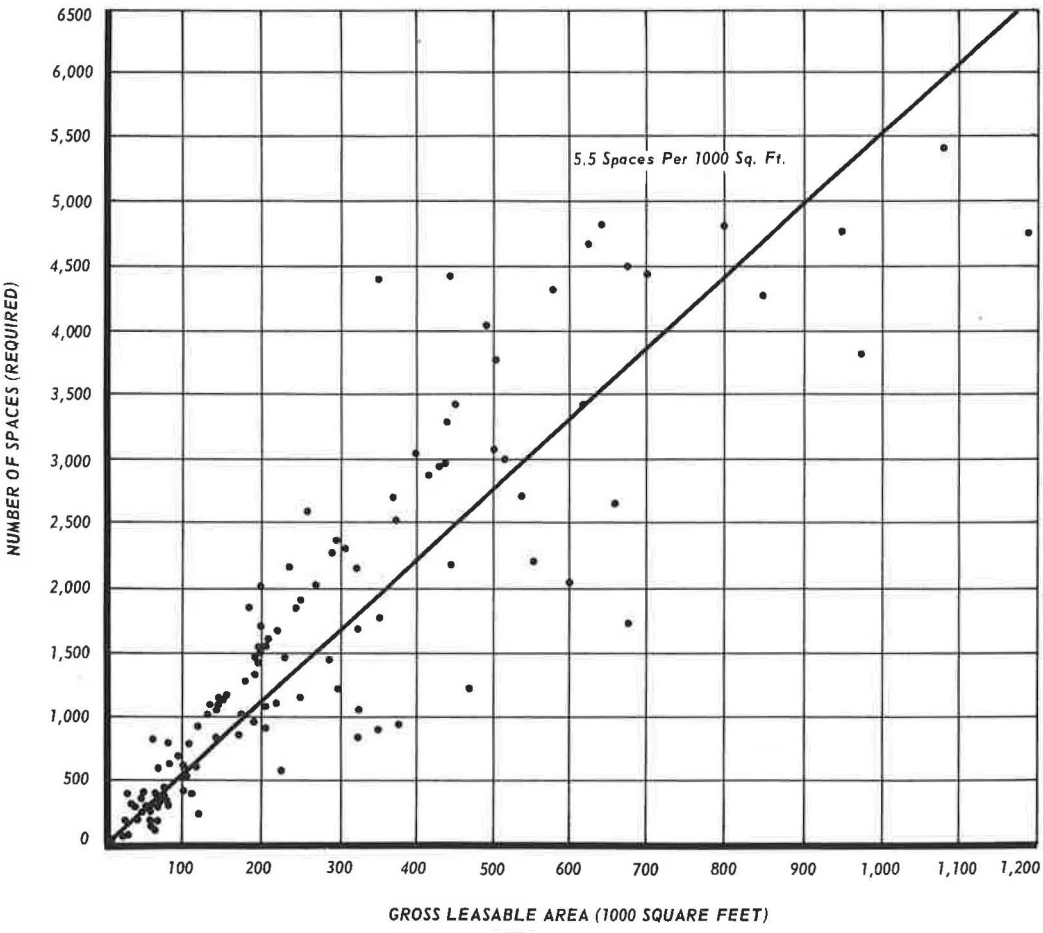

Figure 6. Parking spaces required by existing zoning by gross leasable area in relation to recommended standard.

activities, and (c) the influence that the location of the theater within the shopping center has on parking requirements.

RECOMMENDED STANDARD COMPARED TO EXISTING ZONING REQUIREMENTS

Forty percent of the centers in the survey reported information making possible an accounting of the number of parking spaces required by the provisions of a local zoning ordinance. These parking space requirements are plotted in relation to the gross leasable area of the shopping centers in Figure 6. A line representing the recommended standard of 5. 5 spaces per 1000 square feet of gross leasable area in the center (exclusive of theater and office space) is also shown. This figure shows that the ratios of number-of-spaces-required-by-zoning to center-size vary widely. It also shows that 56 percent of the shopping centers shown were located in areas where the local zoning ordinance parking requirement was higher than the recommended standard.

Since the area required by a parking space varies with a parking lot's layout, this study uses the parking index, or number of car spaces provided per 1000 square feet of gross leasable area, rather than the parking ratio, which relates the area of the parking space to the building area.

Many of the dots above the line representing the recommended standard indicate zoning requirements based on the parking ratio of three-feet-of-parking-area to one-foot-of-building area now in common usage. Assuming 400 square feet per parking space, this is equivalent to 7. 5 spaces per 1000 square feet of floor area. The recommended standard of 5. 5 spaces per 1000 square feet is equivalent to 2. 2 feet of parking area for one foot of floor area. In other words, a 2. 2 to 1 ratio is more appropriate than a 3 to 1 ratio, if the ratio formula is to be used in zoning ordinances.

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Appendix A

DEFINITIONS

The data collected from the 270 shopping centers which returned questionnaires are tabulated in Appendix C. Some explanation of definitions and methods of derivation of the data shown is necessary to understand the tabulation, but many items are self-explanatory.

Gross Leasable Area--The total floor area designed for tenant occupancy and exclusive use, including basements, mezzanines, and upper floors, if any, as expressed in square feet measured from center lines of joint partitions and exteriors of outside

walls. This does not include office buildings in which medical, dental, research, and other kinds of special organizations are housed, nor theaters, although it does include banks and other such activities which are part of the shopping center (6). It should be noted that this definition of gross leasable area does not include space in office or theater use.

Parking Spaces Available—The total parking spaces available within the center provided for all purposes, whether used by employees or customers. They were determined by actual count. (A few centers excluded those spaces for employees which are so located that customers never use them; e.g., in rear service areas.) The number of spaces used by employees was determined by counting the number of cars parked in the lots before the stores opened in the morning. These spaces were then subtracted from the total to get the number of spaces available for customer parking. For the 31 cases in which customers park outside the center the number of parking spaces thus used was estimated, using information provided by the questionnaires.

Peak Parking Demand—The peak customer and employee parking demand for each day at a shopping center shown here as the higher of the afternoon and the evening counts. (The number of customer cars parked is derived by subtracting the number of empty spaces counted from the number of spaces available to customers both inside and outside the center.) The day in the 12-day period which had the highest number of parked cars is shown in the column labeled "Max. Day." The numbers of cars parked at the peak times on the second- and third-highest days are also shown. In some instances the same peak parking demand occurred at a given center on two or three of the top three days, so the first, second or third observation might be the same.

Estimated Parking Spaces Required by Zoning—Several shopping centers gave the actual number of parking spaces required by their zoning ordinances, while others gave only the zoning standards from which the numbers of spaces required were estimated. Since the floor area definitions used by the various ordinances had minor differences, the numbers shown here vary slightly in their degrees of accuracy. (These calculations assumed 400 square feet per parking space.)

Appendix B

SURVEY TECHNIQUE

The following excerpt from the instruction manual sent to all shopping centers participating in the survey describes the counting procedures used (6).

Survey Technique

In setting up the program to count the empty parking spaces, the following steps should be carried out.

1. A person at the management level should be selected to head up this program.
2. He should be assigned a man who is to do the actual counting. This may be a full-time employee or a part-time worker.
3. The manager of this project should go through all the procedures with the counter to be sure he is doing an adequate job to get a good approximation of the number of empty spaces. These would include:
   a. Dividing the area up into clusters or units of about 300 parking spaces and selecting a walking pattern around the Center that will permit one to count all the empty spaces that exist in each cluster around the Center. It might be helpful to first lay out such a pattern on a site plan, like Figure 1, and then go out and actually review it with the counter. At this time it should be possible to determine how long it will take to walk around the Center, thereby making it possible to set up a time schedule for the counter.
   b. The manager should then instruct the counter on what is meant by an empty space. For example, if a car is pulling in or out of a space, that space should

be considered occupied. If a car is waiting to pull into a space that car should be considered as filling an empty space somewhere else. If a car is parked in an illegal space, it should be considered as filling a space somewhere else.

c. After the walking pattern has been determined, a trial run should be made to determine what is the best way to record the empty spaces. If a hand-counter is available, this should be used. In other cases, it may be possible for the man to continually count the number of spaces until he goes all the way around the lot, and then record the number on the form (Table II). Or, you might develop a tally sheet to record empty spaces in each cluster or unit.

d. Once the test program has been set up, the starting times for the count should be the same for each day—2:30 and 8:00 p. m. The counts should be taken each day between December 11 and 24. The counter should always start from the same starting point.

Reference

6. Manual for Developing Parking Data at Shopping Centers in the United States and Canada During the Pre-Christmas Season, 1964.

Appendix C

SHOPPING CENTER CHARACTERISTICS

1

SAMPLE NO.	AGE IN YEARS: 1–2	AGE: 3–5	AGE: 5+	AGE: OVER 5 WITH LATER ADDITION	AGE: 3–5 WITH LATER ADDITION	RETAIL	OFFICE	OTHER	PARKING SPACES IN CENTER: AVAILABLE	PARKING IN CENTER: CUSTOMER	PARKING: EST OUTSIDE CENTER	FLOOR AREA (100'S SQ. FT.): GROSS LEASABLE	FLOOR AREA: OCCUPIED GROSS LEASABLE	FLOOR AREA: OFFICE	FLOOR AREA: OTHER	OTHER USE: MOVIE	OTHER USE: REC	OTHER USE: CIVIC	OTHER USE: LIBRY	OTHER USE: OTHER	METRO POP (1000'S)	ANNUAL SALES (1000'S)	CUSTOMER TYPE INCOME: LOW	INCOME: MID	INCOME: UP	INDUS	OFF	TRAVLR	OTHER	EST PKG SPA REQ BY ZON CRD	CUSTOMER AND EMPLOYEE PARKING SPACE USED: MAX DAY	2ND DAY	3RD DAY
1	X					X			32	32		109	101								OVER 2000		X			X				27	23	21	16
2				X		X			322	297		259	259								100-250	2500		X		X	X			41	142	132	123
3			X			X			251	233		276	276								500-1000	1800		X		X	X				170	158	152
4		X				X			216	201	5	334	309								OVER 2000	2000	X			X	X			83	86	79	76
5			X			X			240	210		359	304								OVER 2000			X		X					87	83	80
6			X			X			214	214	12	363	363								OVER 2000			X		X					237	212	212
7			X			X			415	390		385	385								1000-2000	4600		X			X			319	285	247	240
8	X					X			220	190		399	384								1000-2000			X			X				119	111	111
9	X					X			296	274		415	415								1000-2000			X			X				176	140	138
10			X			X			296	270		423	423								1000-2000			X			X				191	169	152
11		X				X			250	225		494	494								OVER 2000	2250		X		X	X			247	175	165	145
12			X			X			181	178	58	577	568								1000-2000	3400	X			X				288	233	231	215
13			X			X			185	185		600	600								1-100	2500			X		X			150	160	152	145
14					X	X			343	363	12	611	611								1000-2000	4250		X		X	X			175	313	295	
15			X			X			395	395		630	504								500-1000	2457		X			X				336	292	261
16		X				X			1350	1312		642	642								100-250	3628		X	X	X	X			103	526	365	325
17			X			X			354	319	50	661	661								OVER 2000		X	X		X	X				404	404	404
18			X			X			479	431		662	662								500-1000				X		X			795	385	327	269
19	X					X			474	454	75	700	683								500-1000	4970		X		X	X			600	546	505	498
20			X			X			534	498		715	715								1000-2000			X		X	X			357	411	394	381
21			X			X			276	255		717	717								1-100	4890	X	X	X	X			X		276	276	276
22			X			X			458	429		727	697								100-250	1627		X		X	X				295	238	223
23			X			X			305	279		730	696								1000-2000			X						388	305	237	215
24		X				X			617	577		792	792								500-1000	4249	X	X						316	453	279	278
25		X				X			765	629		800	795								250-500	7250	X	X		X	X				518	505	505
26			X			X			563	514		906	848								500-1000										318	298	293
27			X			X			520	420		930	930								250-500	5441	X			X					455	411	368
28		X				X			825	735		947	932								OVER 2000	8000			X		X			710	523	371	352
29			X			X			700	675		795	795								500-1000	2834		X	X						355	354	268
30	X					X			478	433		1029	979								OVER 2000			X	X			X		412	451	443	438
31		X				X			1000	800	50	1100	1060								1000-2000	2750		X		X	X				602	552	532
32	X					X			850	850		1127	1127								1-100			X		X	X				608	510	506
33			X			X			681	628		1170	1170								250-500	7000		X	X		X				610	592	555
34		X				X			934	909		1229	1229								1-100	10000		X	X						641	569	538
35			X			X			1420	1344		1269	1269								500-1000										1230	1215	1202
36			X			X			815	750		1269	1269								500-1000										611	584	539
37	X					X			823	749		1300	1300								100-250	7000	X	X			X		X	1007	543	506	404
38		X				X			776	683		1356	1316								1-100	4500		X		X	X			814	717	639	585
39	X					X			1110	995		1396	1396								250-500	4000	X	X	X	X	X			1047	667	654	648
40		X				X			1012	911		1402	1366								500-1000		X	X		X	X				759	654	592
41			X			X			700	730		1387	1387								500-1000	7000	X	X							360	302	251
42	X					X			1275	1045		1411	1411								OVER 2000	8000	X				X				965	955	950
43	X					X			887	772		1423	1367								OVER 2000	6250	X	X	X	X	X			1067	595	571	546
44	X					X			875	760		1429	1429								1000-2000			X			X				795	795	785
45		X				X			1150	1070		1473	1473								OVER 2000	10750		X			X			1105	675	636	532
46		X				X			1261	1092		1500	1491								250-500	10000	X	X	X	X	X				878	720	702
47			X			X			1276	1035		1559	1559								1000-2000										1015	950	909
48			X			X			1250	1110		1617	1617								500-1000	8000		X		X					745	719	695
49			X			X			1460	1401		1657	1657								250-500										933	902	862
50			X			X			957	668		1687	1687								500-1000										957	957	953
51	X					X			1100	975		1710	1710								1-100	8500		X						850	1053	1022	934

SAMPLE NO.	AGE IN YEARS 1-2	3-5	5+	OVER 5 WITH LATER ADDITION	3-5 WITH LATER ADDITION	RETAIL	OFFICE	OTHER	PARKING SPACES IN CENTER AVAILABLE	CUSTOMER	EST OUTSIDE CENTER	FLOOR AREA (100'S SQ. FT.) GROSS LEASABLE	OCCUPIED GROSS LEASABLE	OFFICE	OTHER	OTHER USE MOVIE	REC.	CIVIC	LIFEY	OTHER	METRO POP (1000'S)	ANNUAL SALES (1000'S)	CUSTOMER TYPE INCOME LOW	MID	UP	INDUS	OFF	TRAVEL	OTHER	EST PKG SPA REQ BY ZON ORD	CUSTOMER AND EMPLOYEE PARKING SPACE USED MAX DAY	2ND DAY	3RD DAY
52		X				X			2269	2134		1820	1800								100-250	7000		X		X				1274	1310	1027	987
53		X				X			1238	1152		1869	1509								1-100	5000		X	X	X	X			1308	622	559	546
54	X					X			1365	1263		1977	1933								1-100	11300		X	X	X	X		X		1156	1071	1054
55		X				X			865	845		1900	1900								1000-2000	16000		X						950	824	758	753
56		X				X			1339	1194		1950	1890								250-500	7500		X	X					1365	1113	1054	1020
57			X			X			1218	1145		1980	1955								100-250	9000	X	X		X					873	871	795
58			X			X			2000	1750		1997	1997								500-1000		X	X	X	X	X				2000	2000	1990
59			X			X			800	620		1000	1000								1000-2000	5250		X		X					690	680	660
60			X			X			880	880		2000	2000								100-250	8000		X		X	X				792	704	682
61		X				X			2200	1900		2010	2010								250-500	12500		X		X	X				1680	1520	1468
62					X	X			1538	1385		2045	2045								500-1000	13361	X	X	X	X	X			921	1368	1308	1193
63	X					X			1847	1727		2085	2085								1000-2000	13000		X	X	X	X			1564	1514	1405	1373
64		X				X			1593	1273		2250	2120								1000-2000	10000		X			X			563	1256	1231	1147
66	X					X			1584	1364		2293	2257								250-500	11000			X					1432	1224	1180	1154
67	X					X			800	700	100	2350	2134								1-100	12000	X	X	X	X	X	X			859	809	788
68	X					X			1400	1400		2350	2350								100-250	11000		X	X	X	X				1400	1369	1016
69			X			X			1329	1189		2400	2400								1-100			X	X	X	X				1283	1282	1271
70		X				X			1815	1715		2400	2400								OVER 2000	12000		X		X				2250	1430	1418	1093
71		X				X			1745	1503	37	2450	2445								250-500	13000		X	X	X	X				1299	1071	904
72	X					X			1722	1472		2500	2334								OVER 2000	20000		X	X	X				1875	1650	1620	1612
73	X					X			1300	1270		2500	2485								100-250	15000		X							1143	1108	1088
74		X				X			1741	1541		2558	2479								OVER 2000										991	923	764
75		X				X			1760	1530		2656	2656								1000-2000			X		X					1630	1516	1349
77			X			X			1500	1300		2800	2800								500-1000	8000		X		X	X				1311	1264	1122
78			X			X			1280	1200		2806	2801								OVER 2000										1280	1272	1188
79		X				X			1967	1812		2845	2845								500-1000	14000		X			X				1987	1987	1956
80	X					X			1651	1441		2847	2290								OVER 2000	14500		X		X	X				971	959	899
81		X				X			1628	1378	20	2850	2780								OVER 2000	23000		X		X	X			1425	1648	1628	1622
82		X				X			1863	1738		2861	2861								1000-2000			X							1291	1287	1240
83			X			X			1886	1754		2875	2875								OVER 2000	16700		X		X	X				1700	1570	1569
84			X			X			1276	1276		2905	2890								1-100										1276	1111	1048
85			X			X			1800	1675		3062	2825								OVER 2000	13600		X		X	X				1800	1800	1800
86		X				X			3150	2834		3173	3083								250-500		X	X		X	X				2319	2162	2124
87		X				X			2010	1785		3210	3000								OVER 2000			X		X				2140	1843	1757	1618
88			X			X			1593	1463		3237	3237								OVER 2000	12000									1593	1441	1426
89	X					X			2297	1951		3250	2720								250-500		X	X	X		X	X		813	1586	1571	1468
90		X				X			1946	1686		3281	3243								250-500	12000		X	X		X			1640	1566	1491	1273
91		X				X			2263	2163		3283	3283								100-250	14000		X		X	X				2112	2000	1943
92			X			X			1846	1771		3330	3308								500-1000	12000		X		X	X				1431	1227	1204
93		X				X			3404	3219		3501	3073								1000-2000			X						1750	1271	1139	1103
94			X			X			2122	1812		3505	3505								1000-2000										1997	1973	1762
95			X			X			2150	2150		3556	3531								500-1000	22000		X	X		X				2150	2150	2150
96			X			X			2128	1796		3750	3750								OVER 2000	40000		X		X				938	2118	2105	2101
97		X				X			4385	3973		3830	3698								500-1000	12500		X	X		X				3630	3153	3034
98			X			X			1154	1038		2143	1721								500-1000	8500		X	X	X	X				741	728	611
100			X			X			2044	1744		4274	4274								500-1000	25000	X	X		X	X			1069	2012	2005	2005
101	X					X			4040	3727		4350	4346								250-500	18000	X	X	X	X	X			2941	2997	2572	2439
102			X			X			3200	2975		4389	4389								500-1000	21000	X	X		X	X			4389	2146	1864	1828
103			X			X			3047	2887		4394	4284								OVER 2000	20472		X		X	X				2517	2472	2457
104		X				X			3195	2900		4690	4600								500-1000	16000	X	X	X	X	X				2014	1953	1545
105		X				X			3130	2842		4960	4760								250-500	24000	X	X	X	X	X	X			2841	2675	2358

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SAMPLE NO.	AGE IN YEARS: 1-2	AGE: 3-5	AGE: 5+	AGE: OVER 5 WITH 3-5 LATER ADDITION	RETAIL	OFFICE	OTHER	PARKING SPACES IN CENTER: AVAILABLE	PARKING IN CENTER: CUSTOMER	PARKING: EST OUTSIDE CENTER	FLOOR AREA (100'S SQ. FT.): GROSS LEASABLE	FLOOR AREA: OCCUPIED GROSS LEASABLE	FLOOR AREA: OFFICE	FLOOR AREA: OTHER	OTHER USE: MOVIE	OTHER USE: REC	OTHER USE: CIVIC	OTHER USE: LIBRY	OTHER USE: OTHER	METRO POP (1000'S)	ANNUAL SALES (1000'S)	CUSTOMER TYPE INCOME: LOW	INCOME: MID	INCOME: UP	INDUS	OFF	TRAVL	OTHER	EST PKG SPA REQ BY ZONORD	CUSTOMER AND EMPLOYEE PARKING SPACE USED: MAX DAY	2ND DAY	3RD DAY
106	X				X			2818	2471		5000	4950								OVER 2000			X							2198	2190	2168
107			X		X			3917	3417		5105	5105								500-1000	30000	X	X	X	X	X	X		3066	3273	3151	2657
108		X			X			3573	3013		5920	5920								100-250	75000	X	X	X	X	X			2960	2100	1894	1737
109		X			X			4325	3950		6127	5876								1-100			X	X	X	X				2836	2789	2772
110		X			X			4500	4000		6145	6145								1000-2000	30000		X	X		X		X	3400	3859	3585	3580
111			X		X			3929	3069		6926	6926								250-500	58500		X			X	X			3929	3874	3703
112		X			X			4425	4015		6192	5404								1000-2000	20000		X						4644	2638	2625	2282
113		X			X			3099	2843		6395	6271								1000-2000				X					4796	2784	2765	2171
114			X		X			4738	4038		6997	6997								500-1000		X	X	X	X	X			4373	4135	3977	3484
115			X		X			5000	4700	150	7540	7500								1000-2000			X	X	X	X		X		4275	4248	3508
116	X				X			5400	5050		9680	9080								OVER 2000	39000			X		X			3812	5400	5400	5400
117	X				X			250	180		280	280								1000-2000	2300		X			X				213	202	190
118			X		X			518	423		500	500								1000-2000	3400		X			X				393	375	374
119	X				X			1200	1140		1110	1110								1-100	6000	X	X		X	X	X			1200	1200	1196
120		X			X	X		287	252		231	216	40							500-1000			X			X			185	143	133	130
121	X				X	X		315	225		369	369	33							250-500	2100			X		X			300	281	257	249
122	X				X	X		250	225		399	372	29							1000-2000	1400		X	X	X	X			185	161	108	93
123	X				X	X		235	190		468	468	42							OVER 2000	2500		X			X			351	157	147	143
124			X		X	X		400	375		478	478	5							1000-2000	5000			X		X			278	336	300	298
125			X		X	X		335	319		526	526	93							1000-2000	2258		X		X	X				335	328	324
126			X		X	X		196	156		597	441	43							250-500			X		X	X				184	183	174
127	X				X	X		360	315		612	598	32							OVER 2000	3000		X		X	X			306	247	236	235
128		X			X	X		358	314		656	587	25							100-250	2025		X			X			218	208	198	190
129		X			X	X		325	265		710	634	32							OVER 2000	4500		X		X	X			355	290	266	262
130			X		X	X		687	625		720	680	24							250-500	4000		X							375	326	284
131			X		X	X		338	296		732	588	13							1-100		X	X		X	X			339	203	189	188
132			X		X	X		412	235		770	770	58							500-1000	4239			X					578	412	412	406
133			X		X	X		406	324		787	787	100							1000-2000	3100			X		X			787	345	334	319
134	X				X	X		455	400		792	693	93							OVER 2000			X			X				273	261	245
135			X		X	X		371	328	2	820	800	130							1-100	3006		X		X	X				209	205	167
136	X				X	X		714	683		884	776	42							1000-2000			X		X	X				220	214	186
137			X		X	X		104	82		900	900	69							1000-2000	2339		X			X				104	104	104
140			X		X	X		550	430		1000	1000	8							250-500	3000	X	X	X			X			408	346	329
141			X		X	X		595	567		1000	928	120							OVER 2000	4500		X	X		X			579	308	283	266
142			X		X	X		410	380		1008	760	140							1-100	1031	X	X		X	X				392	391	383
143			X		X	X		1300	1225		1014	1014	55							1-100	4100		X		X					731	707	675
144		X			X	X		872	819		1073	910	14							1-100			X	X	X	X	X			407	385	365
145			X		X	X		533	508		1102	1080	120							OVER 2000		X			X					300	267	250
146		X			X	X		864	806		1134	1032	13							1-100			X	X	X	X				355	344	335
147	X				X	X		628	523		1143	1143	86							100-250	3500		X			X			403	460	448	441
148	X				X	X		836	781		1158	1158	130							1000-2000				X		X				397	354	336
149		X			X	X		700	615		1177	1177	130		X					OVER 2000	5000		X		X	X			588	585	575	405
150		X			X	X		716	663		1222	1154	30							OVER 2000			X			X			244	585	578	549
151		X			X	X		1200	1100		1324	1324	61							250-500			X		X	X				812	787	589
152			X		X	X		1000	850		1430	1430	75							100-250	10000		X		X		X			831	816	808
153	X				X	X		1082	1027		1484	1473	12							500-1000	7625		X		X	X				580	532	519
154		X			X	X		906	744		1550	1550	18							1000-2000	12000		X			X			1163	895	881	871
155			X		X	X		1500	1375		1612	1564	110							250-500	7000		X							1224	911	830
156			X		X	X		911	694		1650	1560	23							1-100	7400		X							802	775	752
157			X		X	X		1870	1731		1660	1624	20							1-100	6000		X	X	X	X				1069	1068	1037
158		X			X	X		1267	1102		1710	1710	60							250-500	10000		X		X					891	866	831

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SAMPLE NO.	AGE IN YEARS: 1-2	AGE: 3-5	AGE: 5+	AGE: OVER 5, 3-5 WITH LATER ADDITION	RETAIL	OFFICE	OTHER	PARKING SPACES IN CENTER: AVAILABLE	PARKING IN CENTER: CUSTOMER	EST OUTSIDE CENTER	FLOOR AREA (100'S SQ. FT.): GROSS LEASABLE	OCCUPIED GROSS LEASABLE	OFFICE	OTHER	OTHER USE: MOVIE	REC	CIVIC	LIBRY	OTHER	METRO POP (1000'S)	ANNUAL SALES (1000'S)	CUSTOMER TYPE INCOME: LOW	MID	UP	INDUS	OFF	TRAVEL	OTHER	EST PKG SPA REQ BY ZONORD	CUSTOMER AND EMPLOYEE PARKING SPACE USED: MAX DAY	2ND DAY	3RD DAY
159	X				X	X		1402	1350		1735	1735	15							100-250	11000		X		X	X				1125	1113	1091
160			X		X	X		501	501		1736	1716	51							1-100	7000	X	X	X	X	X	X		1000	501	425	362
161			X		X	X		780	710	500	1758	1738	64							100-250	7964		X		X					1081	1045	1029
162			X		X	X		1700	1350		1800	1680	21							250-500		X	X		X	X				1480	1480	1465
163		X			X	X		1254	992		1814	1814	130							1-100	6200	X	X	X	X	X				751	713	612
164			X		X	X		1325	1125		1900	1900	4							OVER 2000	11000		X		X	X			1425	1225	1197	1191
165		X			X	X		1706	1640		1945	1945	17							250-500			X			X				1306	1306	1256
166		X			X	X		1300	1190		1955	1755	11							OVER 2000	7900	X	X		X	X			1466	826	687	673
168			X		X	X		1000	839		1614	1503	35							1000-2000			X		X	X				563	508	467
170	X				X	X		1603	1408		2003	1941	135							100-250	6000		X	X	X	X			2003	1334	1178	1045
171			X		X	X		1126	1024		2183	2138	178							250-500			X	X	X	X				993	970	961
172		X			X	X		1279	1137		2190	2117	47							OVER 2000	9750		X		X	X			1643	704	695	624
173			X		X	X		1150	1040		2198	2198	174							1000-2000	10750	X	X		X	X			1099	1119	1109	1051
174			X		X	X		1400	1285		2356	2356	100							500-1000	12899		X			X				1400	1400	1380
175			X		X	X		1549	1227		2500	2500	100							1000-2000	15000			X					1150	1458	1425	1406
176		X			X	X		1316	1185		3000	1700	10							100-250	15000		X			X				1095	1041	952
177			X		X	X		3000	2781		3059	2995	300							1-100	20600	X	X	X	X	X			2294	1793	1790	1679
178			X		X	X		1848	1773	12	3353	3107	60							OVER 2000	23000		X		X					1548	1540	1505
179			X		X	X		1617	1457		3354	3238	54							100-250	12000		X	X	X	X				1505	1441	1427
180			X		X	X		1550	1405		3433	3398	83							OVER 2000	17092		X	X	X	X				1549	1498	1290
181			X		X	X		1739	1639	35	3500	3500	200							1000-2000	15000	X	X		X				875	1287	1258	1119
182			X		X	X		3000	2900		3500	3500	20							1000-2000			X	X						2548	2350	2350
183	X				X	X		3047	2852		3694	3685	12							1000-2000	22700		X		X	X			2509	2556	2323	2242
184		X			X	X		2200	2020	20	3700	3700	125							1000-2000	20000	X	X		X	X			2590	2220	2215	2215
186			X		X	X		4200	3877		3752	3717	59							100-250	16629	X	X	X	X	X	X			3448	3411	3350
187		X			X	X		1859	1659		3973	3930	100							OVER 2000	25000		X	X		X				1856	1833	1822
188			X		X	X		1127	916		2948	2860	29							500-1000	14000			X		X			2358	1101	1096	1080
189			X		X	X		1270	1270		2974	2974	7							OVER 2000	18000	X			X				1201	1242	1241	1178
190			X		X	X		3842	3627		4395	4395	6							OVER 2000	26500		X		X	X			3296	2656	2256	1987
191		X			X	X		2486	2346		4443	4418	280							OVER 2000	26000	X	X	X	X				2222	2395	2369	1974
192	X				X	X		3046	2865		4534	4297	62							250-500			X	X	X	X		X		2868	2631	2457
193	X				X	X		2587	2264		4825	4750	250							250-500			X							2564	2557	2488
194		X			X	X		3032	2584		4875	4800	65							500-1000				X						3562	3332	1850
195			X		X	X		3500	3000	100	5300	5300	350							500-1000	26000	X	X	X						3600	3600	2967
196			X		X	X		2250	2200		5500	5350	120							OVER 2000	29000		X	X		X			2200	2300	2250	2250
197		X			X	X		4351	3764		5090	4896	30							250-500	30000		X	X		X				3353	3323	2998
200			X		X	X		4001	3501		6591	6591	47		X					OVER 2000	36000	X	X		X	X	X		2637	3234	3118	3081
202			X		X	X		3951	3451	75	6736	6736	408							1000-2000	35000		X	X	X	X			4491	4094	3933	3735
203		X			X	X		6492	6080		6902	6858	480		X					1000-2000	35000		X	X						4577	4575	4266
204			X		X	X		5769	5408		8022	7924	50							1000-2000	48300		X	X		X			4812	5472	5291	5276
205			X		X	X		5352	4502		9438	9158	75							OVER 2000	60000		X	X	X	X				4964	4908	4201
206		X			X	X		3800	3500		6000	6000	250							1000-2000	25000		X							2806	2551	2525
209		X			X	X		3000	2700		2440	2440	40							OVER 2000	15000		X	X	X	X	X		1830	3000	3000	3000
210		X			X	X	X	270	260		278	278	13	8				X		250-500	1000	X			X	X			403	48	47	45
211		X			X	X	X	272	260		455	455		16				X		250-500	2200	X	X		X	X				175	145	141
212		X			X	X	X	205	190		509	500	9	46				X		250-500	1250	X	X		X	X			407	160	124	119
213		X			X	X	X	400	350		626	626	58	25					X	500-1000	2435		X			X		X		391	388	384
214			X		X	X	X	437	412		630	630		150		X				OVER 2000	4300			X					313	229	219	196
215		X			X	X	X	353	303		693	693				X				1000-2000			X			X				333	315	311
216	X				X	X	X	983	926		762	588			X					1000-2000			X						381	870	590	590
217		X			X	X	X	446	401	15	873	863		140		X				1-100	4361	X	X	X	X	X				419	404	381

SAMPLE NO.	AGE IN YEARS 1-2	3-5	5+	OVER 5 3-5 WITH LATER ADDITION	RETAIL	OFFICE	OTHER	PARKING SPACES IN CENTER AVAILABLE	CUSTOMER	EST OUTSIDE CENTER	FLOOR AREA (100'S SQ. FT.) GROSS LEASABLE	OCCUPIED GROSS LEASABLE	OFFICE	OTHER	OTHER USE MOVIE	REC	CIVIC	LIBRY	OTHER	METRO POP (1000'S)	ANNUAL SALES (1000'S)	CUSTOMER TYPE INCOME LOW	MID	UP	INDUS	OFF	TRAVL	OTHER	EST PKG SPA REQ BY ZONORD	CUSTOMER AND EMPLOYEE PARKING SPACE USED MAX DAY	2ND DAY	3RD DAY
220		X			X	X	X	474	429		1000	1000		7C					X	OVER 2000	5700		X			X				387	384	322
221			X		X	X	X	587	521		1020	1008	12	14C			X			250-500	5500		X	X	X	X				396	350	326
222			X		X	X	X	617	537		1060	1060			X					1000-20CC	5500			X		X			505	598	582	58C
223			X		X	X	X	670	584	22	1093	1078		41					X	500-1000	3299		X	X					765	613	611	6C6
224		X			X	X	X	566	526		1187	980		78					X	1000-2000		X			X				890	410	263	248
225	X				X	X	X	1251	1217		1260	1260		2C		X				100-25C	9000	X	X		X	X				903	890	856
226			X		X	X	X	869	741	50	1302	1302			X					100-250										907	907	840
227			X		X	X	X	725	650	30	1350	1339	22	18					X	1-100	7500	X	X		X	X			1000	613	572	554
228	X				X	X	X	996	910		1359	1343		21C		X				1-100			X		X				1019	422	405	398
229			X		X	X	X	1700	1660		1455	1455	9	54					X	500-1000	7200		X			X			1091	543	514	493
23C			X		X	X	X	1008	924	20	1497	1497	113	143		X				10C-250	5212		X		X	X				1028	1028	1028
231				X	X	X	X	1772	1620		1666	1666	142	18					X	1000-2000	7800		X		X	X				1067	1060	1039
232			X		X	X	X	1645	1465		1685	1685	198	141		X				1-10C	4524		X		X	X				1513	1475	1475
233		X			X	X	X	1693	1618		1867	1803		188		X				100-250	7700		X		X	X			1867	1490	1370	1322
240			X		X	X	X	1319	1138		2032	1900	221	19C		X				1000-2000	8C00		X		X	X			1712	1207	1050	851
241			X		X	X	X	221C	1650		2047	1875	350	371		X				250-500	20C00		X						1535	2313	1998	196C
242		X			X	X	X	2252	1792		2053	2053	32		X					OVER 200C			X			X				1402	1252	1252
243	X				X	X	X	1368	1097		2100	2050	3C	3C			X			500-10CC	15000		X	X		X	X		1050	1281	1157	1135
244			X		X	X	X	1533	1384	25	2180	2180	73C		X					250-50C			X	X		X				1558	1546	1544
245		X			X	X	X	1703	1500		2351	2277	85		X					500-10C0	10000		X		X	X			2351	1553	1394	1288
246			X		X	X	X	1638	1241	37	2615	2505		28					X	5CC-10CC	11900		X	X					2614	1589	1514	1483
247					X	X	X	1761	1507	10	2707	2681	166	392		X				250-50C	9800	X	X	X	X	X			2030	1706	1701	1374
248			X		X	X	X	1632	1380		2714	2714	108		X					1-100	9124		X	X	X	X				1632	1632	1632
249		X			X	X	X	250C	2300		2020	2020		98C		X			X	OVER 20CC	9800		X		X	X			1515	2500	2500	25CC
251			X		X	X	X	1654	1582		2985	2877	384	182		X				10C-250	3109		X		X	X				1256	1209	1207
252			X		X	X	X	979	936		3044	2996	353	198		X				1C00-20CC	5291	X			X					936	830	81C
253			X		X	X	X	2170	2020		3059	3059		344					X	OVER 20CC	24000		X			X				1995	1985	1919
254	X				X	X	X	3C00	2637		3458	3329			X					1C00-200C	2C00C	X	X	X	X	X				2301	2243	2137
255			X		X	X	X	1972	1515		3475	3470	465		X					500-1000		X	X	X	X	X				1651	1638	1607
256			X		X	X	X	1965	1665	50	3500	3500	170		X					1000-200C	17000	X	X		X	X				1915	1847	1819
257			X		X	X	X	2316	2126		3500	3500	70	45			X			100-250	20000		X	X					4375	1759	1563	1383
258			X		X	X	X	937	737	100	3515	3515	295	173	X			X	X	OVER 2C00	17479		X							1037	1037	1037
259			X		X	X	X	360C	3280		3839	3282	137	479					X	1000-2000	14144		X			X				1683	1648	1504
260	X				X	X	X	1800	1600	50	3846	3636	18	278		X	X	X	X	100-250	7000	X	X	X	X	X	X			1850	1802	1750
261			X		X	X	X	1200	994		2287	2287	291	181	X	X				1000-2000	4965		X		X	X				984	953	934
270			X		X	X	X	2275	2172		4030	4030			X					500-100C	29C0C		X	X	X	X			3023	2209	2143	1554
271			X		X	X	X	2181	1805		4207	4207	86	360		X	X			1000-2000			X	X	X	X			2875	1849	1731	1699
272			X		X	X	X	3132	2507		5231	5228	401	218		X				1-100	8316		X		X	X				3118	3110	3089
273		X			X	X	X	3143	2968		4306	4239		175						1C00-20CC	2C000			X					2960	2769	2449	21C9
274	X				X	X	X	3500	3250		4500	4446	17	24	X		X			1000-200C	20000		X			X			3375	2558	2520	2444
275	X				X	X	X	2184	1984		4566	4170	70				X			100-250			X			X				1989	1958	1686
276			X		X	X	X	2800	2644		4580	4580	70		X					1000-200C		X	X		X	X				2566	2464	2437
277			X		X	X	X	2825	2185		4597	4179				X			X	OVER 200C			X		X					2206	2200	1606
278			X		X	X	X	3675	3150		4722	4382	279	151	X	X				250-500	25C00	X	X	X	X	X			1207	2994	2629	2585
279			X		X	X	X	4514	4244		4859	4859		402	X	X				OVER 200C	38000		X	X	X	X				4514	4514	4514
280			X		X	X	X	1792	1292		4901	4901	39	1132	X	X			X	1000-2000	20000		X			X			4C67	2239	2161	2088
281		X			X	X	X	3813	3180		5000	5000	72	100	X		X	X		OVER 200C	21000		X						3750	2937	2924	2863
282			X		X	X	X	4313	3456		5326	5005			X					OVER 200C	30000		X	X	X	X			2663	3629	3570	3445
283		X			X	X	X	3097	3097		5620	5620	30	60			X			250-50C	40000	X	X	X	X	X				3297	3256	3165
284			X		X	X	X	4500	3500		5750	5750			X					500-1000	30000	X	X	X	X	X	X		4313	4500	4500	45C0
290			X		X	X	X	2675	1905		6000	6000	272		X					100-250	30000		X	X		X			2068	2523	2523	2461

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SAMPLE NO.	AGE IN YEARS 1–2	3–5	5+	OVER 5 3–5 WITH LATER ADDITION	RETAIL	OFFICE	OTHER	PARKING SPACES IN CENTER AVAILABLE	IN CENTER CUSTOMER	EST OUTSIDE CENTER	FLOOR AREA (100'S SQ. FT.) GROSS LEASABLE	OCCUPIED GROSS LEASABLE	OFFICE	OTHER	OTHER USE MOVIE	REC	CIVIC	L : R F	OTHER	METRO POP (1000'S)	ANNUAL SALES (1000'S)	CUSTOMER TYPE INCOME LOW	MID	UP	INDUS	OFF	TRAVEL	OTHER	EST PKG SPA REQ BY ZONORD	CUSTOMER AND EMPLOYEE PARKING SPACE USED MAX DAY	2ND DAY	3RD DAY
291			X		X	X	X	4569	3754	100	6287	6251	20	10			X			OVER 2000	40000		X		X	X				4518	4497	4331
292			X		X	X	X	5000	4100		6731	6731	29	512		X			X	250-500	35000		X		X				1683	4729	4715	4633
293			X		X	X	X	4750	4138		7500	7437	330	142	X				X	1000-2000			X	X	X	X				4750	4625	4599
294		X			X	X	X	6000	5521		7827	7827	102	471	X	X			X	OVER 2000	65000		X			X			7827	5497	5323	4394
295			X		X	X	X	4465	3956		7894	7894	500	200	X				X	1000-2000	42000		X		X	X				4132	3652	3506
297		X			X	X	X	6157	5157		9458	9358		275					X	OVER 2000	75000		X		X					6657	6607	6457
298		X			X	X	X	5600	5015		9487	8481	664	52			X			500-1000			X		X	X			4739	4273	4148	4038
299			X		X	X	X	6800	6500		9500	8700	300		X					1000-2000		X	X	X	X	X	X			5143	5087	5046
300			X		X	X	X	6000	4900		8220	8200	10		X					1000-2000	60000		X	X	X	X				6000	6000	6000
301			X		X	X	X	4267	3467		8494	8202	544	405	X	X	X			1000-2000	42500		X		X	X			4247	4673	4648	4206
310			X		X	X	X	8000	6800		10105	10105	21		X					OVER 2000	60150		X		X	X				7589	7514	6400
311	X				X	X	X	6615	6165		10812	10425	227	71	X		X			1000-2000	77500	X	X	X	X	X			5405	6505	6243	6238
312			X		X	X	X	5140	4740	990	11900	11898	3	700					X	OVER 2000	75000	X	X	X	X	X			4760	6130	5880	5695
313		X			X	X	X	5718	4025		12500	12000	2250		X					1000-2000	70000			X		X				5306	5289	5253
314		X			X	X	X	6784	6088		12540	12446	271	122		X				1000-2000	53000	X	X	X	X	X				6476	5588	4636

TOTAL RETAIL ONLY 116　　TOTAL RETAIL + OFFICE 80　　TOTAL RETAIL, OFFICE + OTHER 74

Discussion

A. JAMES BATES Barton-Aschman Associates--The shopping center parking index findings of Mr. Voorhees and Mrs. Crow are very welcome as a standard with which a designer or planner may compare his own recommendations. Data at my disposal for large, regional centers tend to confirm the authors' findings that 5. 5 stalls per 1,000 square feet of leasable retail space will accommodate all but the highest parking peaks.

I have never seen year-long data on daily accumulations or traffic movements. However, my observations which were gathered for specific problem analysis and are not directly comparable, one to another or to the authors' findings, bring me (along with the authors of this paper) to the tentative conclusion that the busiest four or five days of the year do occur within the twelve pre-Christmas days. Records of day-to-day sales volumes even more strongly support the dominance of the pre-Christmas shopping season. If one accepts the fact that a regional shopping center will use more than 5. 5 spaces per 1000 only during the pre-Christmas season, then some accumulation curves which were plotted from 1964 and 1965 Christmas seasons counts can be interpreted to support the contention that each 1000 feet of rented space would be only about ten customers a year better off for having 6. 5 rather than 5. 5 parking stalls. For a ½ million-sq ft center, this would mean that 500 additional stalls would accommodate 5000 extra customers.

It might be wise to provide these extra stalls. I was unable to define circumstances so stringent that it could conceivably cost more than $50 per year to provide a parking stall. The authors suggested a figure of $100. Furthermore, marginal stalls need not be as heavily constructed as those which receive daily usage, nor must they be lighted or kept free of snow after the Christmas season. Where these economies are invoked, and land costs and taxes are not excessive, it should be quite possible to own a marginal parking stall for $30 per year.

I do not know exactly what the authors mean by "the possible economic return on such money ($2.00-$3.00 per vehicle parking)." My records suggest that during peaks, other than the Christmas peak, the occupants of each car which is parked spend between $9 and $14. Even if Christmas shoppers do not spend more than other shoppers, there should be a gross mark-up of between $2.00 and $5.00 on the merchandise purchased by each carload of people during the Christmas peak. Because these are "extra" sales, it is realistic not to assign any fixed overhead to them. Therefore, almost the entire gross mark-up can be applied against stall ownership and the balance, if any, be considered profit.

Ten parked cars, each providing a gross mark-up of $2.00 to $5.00, certainly make it feasible to own a $30 per year stall. An interview study conducted concurrently with the authors' study suggested that a staggering $30 to $36 is being spent by Christmas shoppers from each parked car.

How much is a marginal stall worth to a shopping center? Those shopping centers which have ample supplies of parking appear more conspicuously successful than those which are inadequately supplied. I analyzed some of the authors' data in an effort to check out this impression. Those shopping centers in which only retail space was provided, and for which annual sales figures were given, were analyzed in two groups. For the first group, that in which the available parking was not filled, even at the highest observation, it was found that shopping centers which offered more than 5. 5 stalls per 1000 did an annual business of $56 per square foot. On the other hand, those which provided 5. 5 square feet or less, averaged only $44.

Similarly, for the second group, that in which the available parking was saturated during the peak, it was found that centers providing in excess of 5. 5 stalls per 1000 did a $66 annual business, while those providing 5. 5 or less did an annual business of only $60.

Did the provision of additional stalls cause the success or did the success prompt the provision of additional stalls? Perhaps all that can be inferred is that there is a correlation.

In any case, although 5. 5 stalls seem to cover most situations, I would be inclined to recommend the provision of 6 or 6. 5 stalls. After all, the developer who is looking

at our recommendations is doing so in hopes of having a "better" shopping center. Why recommend nothing more than an "average" parking supply to him?

The authors categorically state that the parking index is independent of the size of the center. Intuitively I mistrust this. Limited observations suggest that the smaller centers (400,000 square feet and less) are more responsive to sales, special events, and other influences, and that they may hit peaks more frequently. If so, they would utilize a higher parking ratio advantageously.

My studies show that the smaller, convenience-oriented centers attract more cars proportionally per day than the larger ones, but that cars do not remain parked as long at the smaller centers. For instance, my data show that the average parking duration for regional shopping centers is something over 1 ½ hours. This suggests that the 1-hr average duration, found in the Cleveland-Mueller study, was influenced by a briefer parking period at the smaller centers.

Possibly, the shorter parking durations offset the greater relative automobile attraction of the smaller center and the number of cars parked per 1000 square feet at a given time is irrespective of center size. However, as turnover rates increase, a higher percentage of the total automobiles within the center is circulating in the aisles. For the center to operate safely and smoothly, there should be enough empty spaces available so that this higher proportion of cruising vehicles can come to rest relatively quickly. For this reason alone, a somewhat higher index of parking for the smaller center would appear advisable.

Whether or not 5. 5 stalls per 1000 is the right number, I do not recommend that parking, even for "ordinary" shopping centers, be estimated on a single, rigid index. The varying parking needs of the anticipated tenants should be considered. Among the shopping centers with which I am familiar, those that are more or less dominated by a store with higher prices and a fine quality reputation, seem to do very well financially on substantially fewer parked automobiles than do the centers which are dominated by merchants offering a more competitive line. The convenience center depends on an even greater, relative number of cars per day.

These traffic-generating characteristics of the various tenants proposed for a center should be taken into account and balanced against one another, not only for determining the total amount of parking, but also for distributing this parking about the center and for determining the locational and capacity requirements of the entrances and exits.

A pronounced example of a use which requires special consideration is the tire, battery, and accessory operation. With the reservoir space required for vehicles awaiting service, and for those left outside the service area to be picked up, a much higher parking index than 5. 5 becomes appropriate.

There is a recent trend in larger centers toward the establishment of a convenience goods cluster which is physically removed from the shopping goods area. Where this principle is being employed, a very careful analysis of the relative needs of the two sectors of the center is appropriate.

The authors' conclusions about the provisions of parking for office space (namely, that if the square footage of office space does not exceed 20 percent of the retail space, no special parking need be provided) seems to be applicable to only certain, limited situations.

The 2. 5 parking stalls per 1000 square feet which they recommend will suffice for certain types of decentralized office development; for instance, an insurance company home office. However, shopping center offices, appropriately, have a strong tendency to attract tenants such as doctors and dentists who serve the public directly. Clearly, 2. 5 parking stalls per 1000 square feet will not support a dentist's office on a Saturday afternoon when the usual six patients are in the waiting room. Unfortunately, at this time, his parking demands are in direct conflict with the retail merchant's weekly peak. Similarly, seasonal peaks may conflict; for instance, many school children have dental work done during Christmas vacation. If the general public is to be served, the parking requirements of these offices should be studied carefully.

In summary, it appears that an "ordinary" shopping center will work with 5. 5 stalls per 1000 square feet. Perhaps the authors' earlier recommendation of 7 stalls per 1000 for the first 200,000, and 5. 5 for the balance, better recognizes the special problems of the smaller center.

Some questions still to be answered are these:

1. What is a parked car worth to a merchant during the pre-Christmas peak?
2. Shouldn't our recommendations follow the experience of the successful rather than the average operator?
3. Shouldn't we seek a set of factors which accounts for the differences between centers rather than a standard for all centers?

HENRY K. EVANS, Wilbur Smith and Associates—Mr. Voorhees' conclusion concerning a past tendency to provide too much shopping center parking in many instances is sound, I believe. However a great deal of caution is necessary in using the simple rule of thumb figure he has proposed--5. 5 spaces--and I am sure he will agree on this.

For example, the 115 figures for third-highest day parking (tenth-highest hour) in Appendix C, exhibit a variation between 1. 6 and 10. 8 spaces per 1,000 sq ft and only 29 of the 115 fall between 5 and 6. (Mr. Voorhees' explanation in the Urban Land Institute Bulletin is that "the so-called 'third-highest day' and the 'tenth-highest hour' are approximately equivalent." Thus, it appears that the "3rd day" column shown in Appendix C indicates approximately the tenth-highest hour.) The great majority (74 percent) of the cases average between 3 and 6, with an overall average close to 5. 0. I assume an allocation added as a reserve to enable free movement, as mentioned in the paper, brings the figure up to 5. 5.

This points up the need to evaluate each center according to its own requirements, as it may actually require parking considerably above or below the norm.

The findings shown in Figure 3 of the Urban Land Institute Technical Bulletin 53 version of Voorhees' paper would seem to suggest that if the entire sample had been taken from shopping centers with space ratios of 8. 8 or better, the tenth highest hour would have been higher than that actually found in the study. It is almost as if there were a capacity restraint working on the two lower curves. If all 103 shopping centers had offered unlimited parking, I feel there is a strong likelihood the tenth highest hour would have been at 6. 2 or higher. Perhaps we should be guided more by such an uninhibited assignment of demand which would argue for a ratio higher than 5. 5. More research among centers with space ratios of 10 or more would help answer this question.

As we well know, no two department stores, or banks, or offices generate traffic alike. I would like to refer to a roundup of actual parking demand ratios which I made recently. This appeared in the April 1963 issue of the Eno Foundation Traffic Quarterly with the title "Parking Study Applications." The figures demonstrate clearly the large range of demand ratios. For example, 19 banks' space requirements ranged between a low of 1. 8 and a high of 10. 8 spaces per 1,000 sq ft. Nineteen retail stores we studied showed a smaller range—1. 4 to 5. 1—but still a substantial variation. (These are normal demands, not seasonal peaks.) In planning a given shopping center, separate factors have to be applied to each different building type, employing judgment of course as to whether the figure would be on the low, middle, or high end of the range for any particular building category. I would agree with Mr. Voorhees' rule of thumb index of 2. 5 for offices in general, but in a particular case this may be considerably low, or high, as he has pointed out. The 20 percent additional office usage may or may not be added without noticeable increase in parking demand. At the 2. 5 ratio, the 20 percent office space would bring demand on weekdays up to the tenth highest hour level, according to Voorhees' paper but, not being open on Saturdays, would not add to the retail peaks on Saturdays before Christmas. But a bank, medical center, post office, or some other office use with high generation potential would not fall under this case, and additional parking would certainly be required.

The point is well made that special circumstances will modify parking needs and it is stated that parking requirements are reduced by as much as two-thirds in a central city area where mass transportation and walk-in trade exist. This sounds somewhat extreme, when applied to the recommended 5. 5 index, as this would reduce the design

index to 1.8. I can report on a recent study of ours revealing how important the transit and walk-in trade are to an urban center in San Francisco, Calif. The Stonestown center, with 59 stores including the Emporium, City of Paris, a large supermarket, restaurant, post office, beauty parlor, bank, automotive outlet, and five-floor medical-dental office building, totaling 1,040,000 sq ft of floor area, has 3,349 parking stalls. It is well served by a street-car line and two bus companies, and is surrounded by residential apartment buildings. Of all entering persons, 7 percent come by transit and 7 percent walk. The peak parking demand of 2.3 spaces occupied per 1,000 sq ft, which occurred on a Saturday, would have been raised only to 2.7 if all pedestrians and transit riders had used autos instead. Or to put it another way, the effect of walk-in and transit is to reduce parking requirements by only 11 percent at this center.

Mr. Voorhees' paper brings to mind a problem we encounter regularly in making business district parking needs studies. I refer now to the problem of estimating peak demands, or "design demand" figures on the basis of parking studies taken in off-peak seasons. If we find a demand for, say, "X" parking spaces during a study in May of the year, and relate that to capacity "Y" to obtain a deficiency "D," this obviously understates the parking deficiency for some other times of the year, notably Christmas. I have frequently employed historical parking meter revenue data to assist in adjusting a particular month's demand to the peak month, or perhaps the eleventh highest month. This method is admittedly rather unsure, since we do not know for a fact that peak parking accumulations are proportional to parking revenues. In a special study on shopping centers by LARTS ("Preliminary Results 1961 Shopping Center Study—Los Angeles Regional Transportation Study," prepared by California Division of Highways) the variation in retail sales was suggested as a possible means of handling this problem.

For the six centers they studied, the peak month, December, represented 17.6 percent of the total year's total, or slightly over double the average month. Further research work is suggested, perhaps in correlating systematic traffic volume counts from fixed counters with parking demand for a given business district.

It would be desirable to see some further correlations made with the data assembled for the subject paper. How does the tenth highest hour compare with the average annual demand? How does the parking index relate to customer income class, and to annual sales per unit area (it appears logical that there would be a positive correlation)?

And finally, more consideration might well be given to exploring demand ratios where no capacity restraint exists.

ALAN M. VOORHEES and CAROLYN E. CROW, Closure--The authors are in general agreement with the point made by both discussants that unique shopping center characteristics must be considered in determining how many parking spaces a particular shopping center should provide. However, it seems to us that selection of a single standard for parking requirements for all shopping centers is desirable even though it has limitations. Municipalities are presently using such standards in their zoning ordinances, although most of those in use are poorly substantiated and not based on empirical research. It is far better to have a standard based on relationships between parking demands and retail floor area, which have been observed at a broad sampling of shopping centers, recognizing at the same time that there are shopping centers which differ from the "average" center and that there are unique situations which must be provided for.

We explored the possibilities of developing techniques which could be used to modify the basic parking requirements, but found that there were too many variables involved to quantify all of these in light of the data we had obtained. Therefore, in the section on Special Circumstances Modifying Parking Requirements, we have attempted to outline the kinds of factors that create different parking requirements at shopping centers and to give some guidelines regarding the effects of these factors.

The discussants expected that a shopping center's size and the nature of its office activities would influence its parking requirements. Our findings are more explicitly mentioned in this draft of the text than in the earlier drafts seen by the discussants.

As was indicated by the discussants, it was quite clear that the capacity of the lot had some influence on shopping center usage and, therefore, had some influence on parking demand. However, as shown by Figure 4, this impact was greatest at the highest hours of the year, while the parking demands were quite similar at the tenth-highest hour and very comparable at the thirtieth-highest hour, regardless of the capacity of the lot. As described, the economic return for providing a large amount of extra parking certainly is not justified.