CHAPTER

# 3

# The Pseudoscience of Planning for Parking

*I have been making believe.... I have fooled everyone so long that I thought I should never be found out...[but] how can I help being a humbug when all these people make me do things that everybody knows can't be done?*

—*THE WIZARD OF OZ*

Cities require off-street parking for hundreds of different land uses, and urban planners must set a specific requirement for each one. How do they do it? Some copy the requirements from nearby cities, others consult *Parking Generation*, and a few conduct special studies or pull the requirements out of thin air. Regardless of the data source, however, planners must go through three steps to set the parking requirement for any land use:

1. Define the land use (such as a fast-food restaurant);
2. Choose the basis for the requirement (such as floor area); and
3. Specify how many spaces are required per unit of this basis (such as 10 spaces per 1,000 square feet of floor area).

## THE THREE-STEP PROCESS

A close look at each of these three steps will show why most cities usually require more than enough spaces to satisfy the peak demand for free parking.

### Step 1: Define the Land Use

The Planning Advisory Service (PAS) of the American Planning Association (APA) reports that cities require parking for at least 662 different land uses (see Appendix A). Because the requirements refer to the number of parking spaces for each land use, the first step in setting a parking requirement is to define the specific land use. Table 3-1 shows a few of the myriad uses for which cities require parking, such as convents, kennels, night clubs, and tea rooms.

**Table 3-1. Selected Land Uses That Have Parking Requirements**

| | | |
|---|---|---|
| Abattoir | Ice cream manufacturing | Rifle range |
| Batting cage | Junkyard | Sex novelty shop |
| Convent | Kennel | Tea room |
| Diet clinic | Landfill | Ultra-light flight park |
| Exterminator | Massage parlor | Veterinarian |
| Furrier | Night club | Wastewater treatment |
| Gas storage plant | Oil change shop | Zoo |
| Horse stable | Pet cemetery | |

Source: Selected from the 662 land uses shown in PAS (2003).

Convents and night clubs clearly create different parking demands, but simply recognizing this difference does not tell planners how many parking spaces either one needs. Nevertheless, planners must set a requirement for every land use—from abattoirs to zoos. Developers and property owners need to know how many parking spaces they are legally obligated to provide for each use. Neighbors also want to know that proposed development will supply all the required parking, so that spillover will not occur. Even when planners do not have good data (or any data at all), they must set a minimum parking requirement for every conceivable land use in their city.

### Step 2: Choose the Basis

After planners have defined the hundreds of possible land uses, they must then require parking spaces in proportion to one or more factors they believe will affect parking demand at each use. The most plausible basis for the requirement is the number of people (employees, customers, visitors, or residents) who will occupy the site, but this number is highly variable over time, and planners cannot predict it accurately. It is also difficult to enforce parking requirements based on the number of people at a site, as Norman Williams and John Taylor explain:

> If a given establishment is found to have more employees than provided for in the parking area, the problem of enforcement resolves itself simply into the question of whether the zoning authorities will insist that a considerable number of employees be fired, which on the whole appears unlikely; and there is always the excuse that this is a temporary rush-order situation, as just before Christmas. For these reasons, parking requirements related to floor space, although a rather crude measure of need, may in fact be more sensible.[1]

Despite the problems of basing parking requirements on the number of people at a site, many cities do so. They also require parking spaces in proportion to many other factors that might predict parking demand. Table 3-2 shows a few of the 216 bases planners have chosen for parking requirements, such as the number of bassinettes (in a hospital), fuel nozzles (at a gas station), holes (at a golf course), nuns (in a convent), or reposing rooms (in a funeral parlor).

**Table 3-2. Selected Bases for Parking Requirements**

| | | |
|---|---|---|
| Amusement devices | Homeless children | Reposing rooms |
| Bassinettes | Interments in one hour | Service bays |
| Clergymen | Largest number of visitors | Tie-downs |
| Driving tees | Mechanics | Users |
| Examination beds | Nuns | Vehicles maintained |
| Fuel nozzles | Operator stations | Washing machines |
| Grease racks | Persons lawfully permitted in pool | |

Source: Selected from the 216 bases for parking requirements shown in Appendix A.

But there is a problem with many bases for parking requirements: property owners can easily increase whatever is supposed to predict parking demand without getting a planning permit and thus without increasing the number of parking spaces. For example, a hospital may add bassinettes and a convent may take in additional nuns without notifying the city planning department. Similarly, where the parking requirement for a church is based on the fixed number of seats or the linear feet of permanent seating, churches can evade the limit by using folding chairs instead of seats attached to the floor. Some churches don't want to pay for parking spaces they use only on Sundays, so they have taken advantage of the folding-chair loophole, as the *New York Times* explains:

> There is a stretch of Flushing, Queens, where Christians, Buddhists, Jews, Muslims and Hindus worship within blocks of one another without a hint of sectarian strife. When it comes to parking spaces, though, it is all-out war.

Every Sunday, a flood of cars descends on the neighborhood, thanks in large part to its dozens of newly built Korean churches. City law requires houses of worship to provide parking spaces for their parishioners if they have seating fixed to the floor, but many of the churches use folding chairs and are thus not covered by that rule. For years, residents have complained bitterly about that situation—and the ungodly noise, the crowds and the cars that often block their driveways.[2]

To avoid these problems cities usually require parking in proportion to something known when a building permit is granted, is difficult to change without another permit, and can be measured easily to verify compliance. For this reason, cities usually require parking in proportion to the built floor space at a site, even if this is a poor predictor of parking demand.[3]

The lack of theory and data helps explain the ad hoc nature of these bases for parking requirements. Put yourself in the shoes of a planner who must recommend the requirement for any land use. When I ask planning students how many spaces they would require for, say, a hospital, they typically answer with some variant of "I don't know, but I'd give it my best shot." This attitude shows the plucky spirit most planners bring to their profession, but it also invites confusion and waste. For example, if a planner guesses that the number of bassinettes in a hospital helps explain parking demand, that number gets factored into the parking requirement for hospitals, regardless of whether it actually affects parking demand (do babies drive?). Without theory or data, who can say whether bassinettes do or do *not* affect parking demand?

Even for the same land use, cities base parking requirements on many different factors. Table 3-3 shows the findings of a survey of 66 cities' parking requirements for funeral parlors, a land use that raises the awkward question of how many spaces to require per...per what? The cities required parking for funeral parlors in proportion to 14 different factors: chapels, dwelling units, employees, families on premises, funeral vehicles, parlor area, parlors, persons of design capacity, seats, seats in chapel, seats in largest chapel, square feet, square feet of seating area, and square feet of other areas. The 66 cities had 27 different requirements, and 20 cities had a requirement no other city had.[4] Each requirement, taken alone, may appear plausible, but collectively these requirements raise grave doubts about planning for parking.

### Step 3: Specify the Number of Spaces

After planners have defined each land use and chosen the basis for each requirement, they must then decide how many spaces to require per unit

**Table 3-3. Parking Requirements for the Afterlife**

| Parking spaces required for funeral parlors | Number of cities |
|---|---|
| 1 per 100 sq. ft. | 3 |
| 1 per 200 sq. ft. | 1 |
| 1 per 250 sq. ft. | 1 |
| 1 per 100 sq. ft. + 1 per dwelling unit | 1 |
| 1 per 100 sq. ft. or 1 per 6 seats | 1 |
| 1 per 5 seats or 1 per 35 sq. ft. seating area, + 1 per 400 sq. ft. other areas | 1 |
| 1 per 3 seats | 1 |
| 1 per 4 seats | 1 |
| 5 + 1 per 5 seats in largest chapel | 1 |
| 1 per 6 seats in chapel | 1 |
| 1 per 3 seats + 1 per funeral vehicle | 1 |
| 1 per 4 seats + 1 per funeral vehicle + 1 per employee | 1 |
| 1 per 5 seats + 1 per funeral vehicle + 1 per dwelling unit | 1 |
| 1 per 25 sq. ft. of parlor area | 1 |
| 1 per 50 sq. ft. of parlor area | 4 |
| 3 per parlor | 2 |
| 4 per parlor | 1 |
| 5 per parlor | 3 |
| 15 + 5 per parlor over 3 parlors | 1 |
| 5 per parlor or 1 per 4 seats | 1 |
| 5 per parlor + 1 per funeral vehicle | 2 |
| 8 per parlor + 1 per funeral vehicle | 9 |
| 10 per parlor + 1 per funeral vehicle | 4 |
| 5 per parlor + 1 per funeral vehicle + 1 per family on premises | 1 |
| 5 minimum | 1 |
| 30 minimum | 1 |
| 1 per 4 persons of design capacity | 1 |
| No specific requirements | 19 |
| **Total** | **66** |

Source: Planning Advisory Service (1971, 36).

of this basis. Planners try to estimate how many parking spaces every land use needs to meet the peak demand for *free* parking, not how many spaces drivers will demand at a price that covers the cost of the spaces. To suggest the problems in predicting need, Table 3-4 presents the requirements for several land uses. Planners typically require at least one parking space per person except at religious land uses (1 space per 10 nuns and 3 spaces per 4 clergymen). The requirements look simple when planners can link parking to people: 1 space per tennis player, 2 spaces per barber, and 3 spaces per beautician. But other requirements are dazzling in their combination of precision and inventiveness: 1 space per 2,500 gallons of water (for a swimming pool), 1.5 spaces per fuel nozzle (for a gas station), and 10 spaces per maximum number of interments in a one-hour period (for a mausoleum). When planners deal with difficult land uses,

**Table 3-4. Pataphysical Parking Requirements**

| Land use | Parking requirement |
|---|---|
| Adult entertainment | 1 space per patron, plus 1 space per employee on the largest working shift |
| Barber shop | 2 spaces per barber |
| Beauty shop | 3 spaces per beautician |
| Bicycle repair | 3 spaces per 1,000 square feet |
| Bowling alley | 1 space for each employee and employer, plus 5 spaces for each lane |
| Gas station | 1.5 spaces per fuel nozzle |
| Health home | 1 space per 3 beds and bassinettes, plus 1 space per 3 employees, plus 1 space per staff doctor |
| Heating supply | 3.33 spaces for every 1,000 square feet of sales and office area, plus 2 spaces per 3 employees on the maximum shift, plus 1 space for every vehicle customarily used in operation of the use or stored on the premises |
| Heliport | 1 space per 5 employees, plus 5 spaces per touchdown pad |
| Machinery sales | 1 space per 500 square feet of enclosed sales/rental floor area, plus 1 space per 2,500 square feet of open sales/rental display lot area, plus 2 spaces per service bay, plus 1 space per employee, but never less than 5 spaces |
| Mausoleum | 10 spaces per maximum number of interments in a one-hour period |
| Nunnery | 1 space per 10 nuns |
| Rectory | 3 spaces per 4 clergymen |
| Swimming pool | 1 space per 2,500 gallons of water |
| Taxi stand | 1 space for each employee on the largest shift, plus 1 space per taxi, plus sufficient spaces to accommodate the largest number of visitors that may be expected at any one time |
| Tennis court | 1 space per player |

Sources: Planning Advisory Service (1964, 1971, and 1991); Witheford and Kanaan (1972).

perhaps they simply close their eyes and tap the heels of their ruby slippers together three times to conjure up the parking requirements.

One parking space per person has become the norm for some land uses. In a survey of 57 of the largest suburban employment centers in the country, Berkeley planning professor Robert Cervero found an average of 3.85 parking spaces per 1,000 square feet of floor area, which was slightly more than one parking space per employee.[5] In his book *Edge City*, journalist Joel Garreau says the rule of thumb is that there must be one parking space for every worker, and as a result, office buildings must provide about 1.5 times as much space to park cars as there is office space for the drivers; he concludes that parking is "the pivot of urbanity and civilization at the approach of the twenty-first century."[6]

Parking requirements appear arbitrary and excessive even when planners have data that purport to predict parking demand. Chapter 2 showed that the ITE parking generation rates are intended to measure the peak demand for free parking at suburban sites without public transit, but many cities require even more spaces. The ITE parking generation rate for office buildings is 2.79 spaces per 1,000 square feet, for example.[7] Nevertheless, in a survey in nine Southeastern states, Stanley Polanis and Keith Price found that cities require an average of 3.7 spaces per 1,000 square feet of office space.[8] Another survey in California found that cities require an average of 3.8 spaces per 1,000 square feet.[9] In a similar survey in Iowa, Minnesota, and Wisconsin, John Shaw at Iowa State University found that cities require an average of 4 spaces per 1,000 square feet.[10] In these surveys, the parking requirements ranged from 33 percent to 43 percent greater than the parking generation rate as computed by ITE.

The generous supply of required parking often goes unused. In a survey of nine suburban office parks with 336 buildings, Gruen Associates found that the parking supply averaged 2.8 spaces per 1,000 square feet, and the peak parking occupancy was 1.4 spaces per 1,000 square feet.[11] Peak parking occupancy ranged from 28 to 61 percent of capacity and averaged only 47 percent of capacity even though 97 percent of all employees arrived by car. A survey by the Urban Land Institute (ULI) at eight suburban business parks in 1986 also found that the peak parking occupancy averaged only 47 percent, and the highest peak occupancy at any site was 61 percent.[12] Surveys in the Seattle region in 2002 found an average peak parking occupancy of only 63 percent of capacity at sites in the Seattle Central Business District (CBD), and 60 percent in the Bellevue CBD; in nine other areas, it ranged between 46 percent and 79 percent.[13] Another survey of 26 neighborhoods in Seattle in 2000 found that the peak occupancy rate for off-street parking was only 61 percent.[14] Surveys in Northwestern Connecticut conducted during the Christmas season found that the peak occupancy was only 36 percent of capacity at big-box retail stores, and 79 percent at shopping plazas.[15] ULI found that the peak parking occupancy at 43 percent of shopping centers in the U.S. was never more than 85 percent of capacity even during the busiest hour of the year.[16] If the goal is to satiate the demand for free parking, many cities

have achieved their objective. Defying Malthus, the number of cars does *not* always increase to fill all the space provided.

Richard Willson conducted case studies of parking demand and supply at suburban office developments in 10 Southern California cities, and he found that the peak parking occupancy averaged only 56 percent of capacity.[17] He also discovered a paradox: the parking lots were half empty even at the time of peak parking demand, but they looked full because the most visible spaces are the first to be occupied:

> These results [the half-empty lots] contradict the impression of the sites as viewed from the street, because the most visible spaces are the most likely to be occupied. This observation suggests that parking utilization counts are essential to counteract any mistaken impressions about parking utilization held by planners, local decision makers, and the public. In these instances, for example, zoning codes required levels of parking almost twice the measured demand, even though parking was free to the motorist. The projects were required to devote land and capital to a substantial number of parking spaces that are normally not used, and thus resources were diverted from providing more building area, better design, and more landscaping or common areas.[18]

City officials, developers, lenders, leasing agents, and tenants all assumed that planners knew how many parking spaces each land use needs, but the oversupply of parking did create doubts:

> One developer described his growing concern about parking after he noticed that spaces in the top floor of the parking structures never had oil spots, indicating that they are seldom, if ever, used.[19]

Developers also reported that they did not supply more parking spaces than the city required.

Other experts on the role of parking in the development process agree with Willson's findings. ULI's Robert Dunphy says:

> In most cases you meet the local [parking] requirements and nobody really thinks about them after that. Developers who do think about the amount of parking needed run into the question of where parking requirements come from and what their rationale is. Often nobody knows.[20]

After seeing the results of Willson's study in Southern California, the Chicago Regional Transportation Authority commissioned similar case studies of parking demand and supply at office developments in 10 Chicago suburbs. These studies found that the average supply of employee parking was 3.6 spaces per 1,000 square feet, that peak parking occupancy was only 68 percent of capacity, and that developers did not supply more parking than required by the zoning.[21] These studies in Chicago and Southern California thus show that cities require parking spaces that are rarely used.

Parking garages are seldom built as freestanding commercial ventures because parking revenues cannot cover the cost. In a study of eight municipal parking agencies in the Middle Atlantic and New England states, Herbert Levinson found that their annual operating revenue per space ranged between 26 and 36 percent of the annual cost per new garage space:

> In most cities it has become clear that downtown parking can no longer pay its own way through parking revenues.... Parking fees are often insufficient to cover the debt service; frequently they are little more than what is required to meet day-to-day operating costs.[22]

Parking spaces are expensive and require large subsidies, but most cities prohibit property owners from using the required spaces for any purpose other than parking (such as for landscaping or as a storage or loading area), even when they turn out not to be needed for parking. No wonder most developers don't provide more parking than the city requires. Some people, of course, want even more parking spaces than the zoning requires, and some new mini-mansions come equipped with "garagemahals" for five or six cars.[23]

Minimum parking requirements appear to exceed the peak demand for free parking in other countries as well. In the United Kingdom, for example, the Department of the Environment, Transport, and the Regions commissioned a study of parking requirements in the Southeast of England. The parking supply exceeded the peak parking occupancy at 33 of the 37 suburban sites studied, and at seven of the nine town-center sites. The conclusion was:

> Demand levels for most land use categories are frequently over-estimated, resulting in parking provision well in excess even of peak time demand.... In the main, developers are required to provide minimum levels of parking on site, related to the gross floor area of the scheme.... Parking provision is frequently well in excess of full demand at peak periods. We can find no justification for such over-provision, which is both wasteful of valuable development land, and encourages profligate use of the car.[24]

These studies conducted throughout the U.S. and in the U.K. suggest that the minimum parking requirements in many zoning ordinances are

excessive, in part because they are based on the assumption that parking should be free. Urban designer Dom Nozzi says:

> When we hear the claim that there is "not enough parking downtown," what we are really hearing is that there is "not enough *free* parking *a few feet* from where I want to go." To demand such an impossible supply of parking is to ask a downtown to compete with outlying suburbs on *suburban terms*, that is, asking for the impossible.[25]

William Whyte, one of America's most astute observers of city life, said that even too much parking is never enough:

> In cities most dominated by parking lots and parking garages a key civic issue is the lamentable lack of parking. Let me cite Dallas. It has the highest ratio of parking spaces to office space in the country. But studies continually call for more parking, and at moderate cost.... Supply has so conditioned demand that parking has become an end in itself, with people in a bondage to it more psychological than physical.[26]

To give an extreme example of this bondage, Montgomery County, Maryland, requires funeral parlors to provide 83 parking spaces per 1,000 square feet of floor area in the main chapel. This astonishingly high and weirdly precise requirement (exactly 83 parking spaces per 1,000 square feet!) means that the parking lot must be at least 25 times larger than the main chapel. One additional parking space must also be provided for each employee on the largest shift (the graveyard shift?) and for each vehicle used in connection with the business.[27]

## CIRCULAR LOGIC

Circular logic is a crucial flaw in parking requirements. Planners observe the peak parking occupancy at suburban sites with free parking but no public transit, and then require at least enough spaces to meet this demand (see Figure 2-9). The parking demand at new land uses with free parking then confirms the prediction that all the required spaces are "needed." A 1982 ULI study, *Parking Requirements for Shopping Centers*, illustrates this problem. Parking has always been a key element in the design of shopping centers, and *Time* magazine enthusiastically described one of the first centers, Southdale, in the 1950s as a "pleasure dome with parking."[28] The high cost of all the parking spaces required for these pleasure domes justified an unusually thorough study—by far the most comprehensive ever conducted on parking for a single land use. ULI suspected that many cities' parking requirements were excessive, and it warned about the environmental and economic costs:

> The community, for example, should avoid the environmental consequences from an unnecessarily large pavement area; the consumer should not be burdened by higher indirect costs from an excessive number of parking spaces.[29]

Despite these good intentions, the study went on to repeat the fundamental errors made in setting minimum parking requirements. ULI gathered data on parking occupancy at 506 participating shopping centers in 41 states and six Canadian provinces. It also obtained detailed parking occupancy counts at 135 centers and daily counts for an entire year at 22 centers. From this survey, ULI estimated the number of parking spaces needed to satisfy the demand for free parking in the 20th busiest hour of the year:

> To provide adequate parking for a typical shopping center today, the number of spaces required is:
>
> 4.0 spaces per 1,000 square feet of gross leasable area (GLA) for centers having a GLA of 25,000 to 400,000 square feet;
>
> from 4.0 to 5.0 spaces in a linear progression, with an average of 4.5 spaces per 1,000 square feet of GLA, for centers having from 400,000 to 600,000 square feet;
>
> 5.0 spaces per 1,000 square feet of GLA for centers having a GLA of over 600,000 square feet.
>
> The provision of parking based on these standards will serve patrons and employee needs at the 20th-busiest hour of the year, and allow a surplus during all but 19 hours of the remainder of the more than 3,000 hours during which a typical center is open annually. During 19 hours of each year, which are distributed over 10 peak shopping days, *some patrons will not be able to find vacant spaces when they first enter.*[30]

These recommendations appear sensible, but the study's methodology has serious flaws. First, parking occupancy was surveyed at sites where parking was free, so the study estimated the demand for *free* parking. Second, requiring enough spaces to satisfy the demand during the 20th-busiest hour of the year (the "design hour") means that the parking lot will be full only 20 hours a year, and many spaces will therefore be unused for more than 99 percent of the year.[31] An earlier ULI study of parking requirements for shopping centers chose the 10th-busiest hour as the design hour. In neither study was the design hour justified by esti-

developers, cities, or society. The only reference cited to justify using the design-hour criterion was a 15-year-old textbook by transportation engineers Martin Wohl and Brian Martin, who severely criticized the design-hour criterion on the grounds that (1) the parking supply influences parking demand and (2) the optimum parking supply cannot be chosen without examining the costs and benefits of the choice:

> While [it] may seem frustrating, and while use of simpler and more straightforward concepts, such as…the thirtieth highest hour, may seem more practical to the 'real world' engineer, the fact remains that proper engineering design techniques require more detailed and more comprehensive analysis.[32]

Despite this admonition, planners set the parking requirements for new shopping centers to meet the demand for free parking observed at existing shopping centers at the 20th-busiest hour. Therefore, planners implicitly base parking requirements on the peak demand for *free* parking, without regard to either the cost of providing the parking or the price that drivers are willing to pay for it.

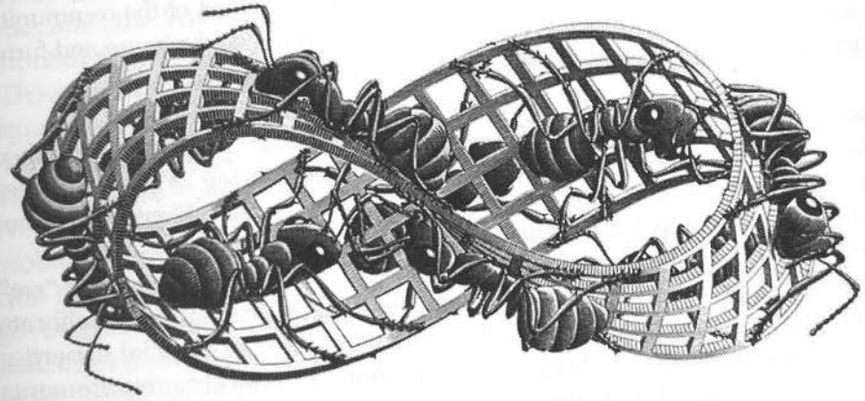
ULI published a second edition of *Parking Requirements for Shopping Centers* in 1999, and it repeated the methodology of the 1982 study with almost identical results.[33] The study again estimated the parking demand at the 20th-busiest hour—around 2 p.m. on the second Saturday before Christmas—but offered no justification for this choice.[34] The study did, however, provide additional information not included in the 1982 study. For example, 90 to 95 percent of all shoppers arrived by car at the "vast majority" of centers, but at 43 percent of the centers the parking lots were never more than 85 percent occupied even at the busiest hour of the year. Parking was generally oversupplied by 0.5 to 1 space per 1,000 square feet of gross leasable area:

> The parking supply is higher than parking demand by an average of almost a full space per 1,000 square feet of GLA for centers smaller than 600,000 square feet, and by about half a space for larger centers. *This suggests that parking supply is not constricting demand. Moreover, it suggests that building more parking spaces will not result in increased traffic volumes and, subsequently, in increased sales at centers.*[35]

Employees accounted for about 20 percent of parking demand during the peak period, which suggests that providing special employee transportation programs (such as off-site parking with shuttle buses) on the few days of the customers' peak parking demand could reduce a shopping center's annual peak parking demand—and the required parking

neglected aspect of parking requirements. [illegible] occurs for only a few hours a year, reducing parking demand during this short time is far more cost-effective than increasing the year-round parking supply. Parking spaces that are occupied for only a few hours a year are a spectacularly bad investment, not only for developers but also for everyone else.

Only 2 percent of the centers charged for parking, and they validated it for customers. Only 1 percent charged employees for parking. This ubiquitous free parking is not surprising: if there are more than enough spaces to satisfy the peak demand at a zero price, why charge for them? Free parking thus leads to the "demand" that planners observe to set parking requirements, and the requirements then perpetuate the free parking. Once the pattern has been established, urban planners project past mistakes into the future, and planning for parking resembles progress along a Möbius strip.[36] (See Figure 3-1.)



M.C. Escher's "Moebius Strip II"
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**Figure 3-1. A Möbius strip with ants (as drawn by M.C. Escher)**

## ESTIMATING DEMAND WITHOUT PRICES

If urban planners do not consider prices when estimating the demand for parking, off-street parking requirements are perfectly circular and wholly unscientific. In foretelling the demand for parking, urban planners resemble the Wizard of Oz, deceived by his own tricks. After he was exposed as a fraud, the Wizard confessed:

> I have been making believe.... I have fooled everyone so long that I thought I should never be found out…[but] how can I help being a humbug when all these people make me do things that everybody knows can't be done?[37]

Planners cannot predict parking demand any better than the Wizard of Oz could give the Scarecrow brains or send Dorothy back to Kansas. When Dorothy accused the Wizard of being "a very bad man" for making promises he couldn't keep, he protested, "I'm really a very good man; but I'm a very bad Wizard, I must admit."[38] Urban planners are good people, but they cannot help being humbugs when they struggle to appear methodologically rigorous about parking requirements. In the 1939 film, the unmasked Wizard resembles a hapless urban planner trying to set parking requirements: he desperately twiddles knobs, wrenches levers, and—when his audience expresses doubt—roars, "Do you presume to question the Great Oz?... The Great Oz has spoken!"[39]

Urban planners get away with their wizardlike conduct because they produce a wonderful result: free parking. If only for parking, planners have produced the utopian life of the Emerald City:

> Each person was given freely by his neighbors whatever he required for his use, which is as much as anyone may reasonably require.... Each man and woman, no matter what he or she produced for the good of the community, was supplied by the neighbors with food and clothing and a house and furniture and ornaments and games.[40]

And, presumably, free parking. Dorothy and the Scarecrow marched down the yellow brick road to the Emerald City singing "We're off to see the Wizard...because of the wonderful things he does!"[41] Then it turns out that what he does is fraud and humbug.

Even the phrase "set a parking requirement" is humbug. The word "set" suggests the possession of special expertise or technical ability to calibrate a finely tuned instrument. But urban planners have no special expertise or technical ability to predict parking demand, and parking requirements are not finely tuned instruments. Planning for parking is a skill learned only on the job, and it is more a political than a professional activity. Perhaps planners merely "impose" parking requirements. At best, these requirements are the outcome of simple tinkering. Whenever a land use begins to create spillover parking, planners nudge up the off-street parking requirement until the problem goes away.

## PROFESSIONAL CONFIDENCE TRICK

"Parking requirement" is a misleading term because it suggests that *buildings* require a certain number of parking spaces. Instead, *zoning* requires the parking spaces, some of which are rarely used. Parking that is not "up to code" sounds risky, like substandard electrical wiring or plumbing, but this is far from true. The only risk of "substandard" parking is perhaps not satisfying the peak demand for free parking.

Because planners are confused, parking requirements are often confusing. For example, when parking requirements are expressed as 1 space per 250 square feet or 1 space per 200 square feet, the difference is not obvious. When the same requirements are expressed as 4 and 5 spaces per 1,000 square feet, the difference becomes much clearer.[42] Nevertheless, planners often express high requirements with "1 space" in the numerator and the number of square feet in the denominator—such as 1 parking space per 50 square feet of floor area. Why? This may occur because the same requirement, phrased instead as 20 spaces per 1,000 square feet of floor area, sounds excessive. This 1-space-in-the-numerator method of expressing a parking requirement enables planners to hide—even from themselves—the large number of parking spaces they routinely require. Urban planners have pulled the wool over their own eyes, and they play a professional confidence trick on everyone—including themselves. When dealing with parking, planners often behave like the Scarecrow who, after the Wizard gave him a diploma rather than brains, blurted an impressive-sounding but gibberish version of the Pythagorean Theorem: "The sum of the square roots of any two sides of an isosceles triangle is equal to the square root of the remaining side."[43]

In urban planning, actions have symbolic value apart from their other consequences, as implied by the slogan: "The things we do show we care, even if they have no other effect." If citizens complain about parking problems, for example, an increase in the parking requirements for a specific land use—at fast-food restaurants, perhaps—can at no cost to the government demonstrate that the city is doing something about the problem, even if planners have no real evidence to show that fast-food restaurants "need" more parking. The costs are hidden, the action is politically useful, and planners can always provide an impressive-sounding rationale to require, say, 1 parking space for every 50 square feet of restaurant space. Few people will understand that the city is requiring parking lots that are six times larger than the restaurants they serve.[44]

## PLANNERS IN DENIAL

Planners sometimes admit parking requirements are misguided but then say this is not a serious problem because developers, lenders, and tenants all demand even more parking spaces than the city requires. But parking requirements would be superfluous if everyone demanded more parking than cities require because developers would then provide the spaces of their own accord. The only empirical studies that have compared the parking supply with parking requirements found that developers usually

supply only the parking that zoning requires.[45] Many developers want to provide more floor space or a different use for their building than their parking supply allows, so they obviously want to supply less parking than the zoning requires. Parking spaces are expensive, and developers do not provide them frivolously.

In my own experience as a member of a Design Review Board for the Los Angeles City Planning Department, I reviewed the plans for all development in Westwood between 1994 and 2003. I saw many projects where the parking requirements limited the floor space of a building, prevented changing its use, or disfigured its design. But I never saw a project with significantly more parking than the zoning requires. Consider a typical case: a 12-unit condominium with two two-bedroom units (2.25 required parking spaces apiece) and 10 three-bedroom units (3.25 required parking spaces apiece). Thirty-seven parking spaces were required, exactly the number supplied in the one level of underground parking. The submitted plans showed that the project had 60 square feet of parking for every 100 square feet of housing. The housing floor area was 38 percent less than allowed by the floor-area ratio in the zoning, which suggested that the parking requirement, not the floor-area ratio, limited the amount of housing.[46] As is typical of condominium projects in Westwood, the subterranean garage was excavated from lot line to lot line, so it was larger than the footprint of the building (which must be set back from the property line on all sides), and all landscaping was in a thin layer of soil above the garage.

A similar case is also instructive: a 19-unit building with 58 parking spaces (2.5 spaces per unit), exactly the number required by the zoning code. Because of the small site, two levels of underground parking were needed to satisfy the parking requirement. The small, two-level underground garage was very inefficient, with 520 square feet of garage floor area per parking space because the ramps, aisles, columns, stairs, and elevators occupied a high proportion of the area. The garage's construction cost was $80 per square foot, so the cost per space was $41,600 ($80 x 520), and the required parking added $104,000 to the cost of each apartment (2.5 x $41,600). With an average apartment size of 1,969 square feet, the required parking added $53 per square foot to the apartment's construction cost ($104,000 ÷ 1,969). The project provided 54 square feet of parking for every 100 square feet of housing. Again, all landscaping for the project was in a thin layer of soil above the garage.[47]

Members of other municipal planning boards report similar cases where cities require developers to sacrifice density, design, and economy to provide more parking. For example, Lawrence Solomon, former Vice-Chairman of the City of Toronto's Planning Board, wrote:

> Without exception, every developer that came before us tried to supply less parking than the planners required, often providing detailed analyses showing that the city was demanding far more spaces than the development would ever need. The developers often obtained concessions in other areas, but never, as I recall, in obtaining exemptions from the parking requirements. I was typically the only vote in the developer's favor—neighborhood pressure for additional parking invariably persuaded the Board.[48]

To examine how parking requirements inflate the parking supply, consider what would happen if cities did *not* require off-street parking. The market would supply parking only when it is profitable (just as the market supplies gasoline only when it is profitable), and there would be fewer spaces. For example, some stores or restaurants might prefer to lose a few customers on the busiest days of the year rather than pay for parking spaces that are often empty. Parking spaces that remained empty for too many hours a day would likely be redeveloped for more productive uses, and the price of parking would increase.

If parking were less plentiful and more expensive, we would own fewer cars. But cities have required off-street parking since the middle of the last century, so car ownership, urban form, transportation infrastructure, and travel habits have adapted to ubiquitous free parking. Most sites now offer free parking, and almost everyone of driving age has a car. We have tailored our housing, employment, and shopping patterns to the plentitude of free parking, and parking demand is now far higher than it would be if zoning had never required off-street parking. An automobile-dependent city is also parking dependent, and by increasing our automobile dependency, off-street parking requirements have increased our parking dependency. The spread of asphalt parking lots may seem inevitable and unstoppable, like lava descending on a doomed city, but planners should recognize that off-street parking requirements are a cause of the problem.

Cities sometimes use high parking requirements as an indirect way to discourage specific land uses. If residents oppose fast-food restaurants, for example, a higher parking requirement can make it more difficult to build them. But this strategy creates even more problems because the fast-food restaurants that *do* get built have supersize parking lots that are asphalt eyesores, and residents dislike them even more. The right solution is to regulate the offending aspects of a land use, not simply to require more parking spaces that make that land use even more undesirable.

Because high parking requirements impose a high cost on development, they might be explained as an indirect way for cities to control growth and the associated traffic congestion. But if cities want to control traffic,

high parking requirements have a serious unintended consequence. If all new development comes with free parking, the inevitable result is more vehicle trips and traffic congestion. Growth would scarcely be noticed if the new people came without cars. High parking requirements are thus a perverse way to control growth if the real goal is to limit traffic. Some cities require bicycle racks to encourage cycling, but most planners and elected officials do not seem to recognize that parking requirements will likewise encourage driving.

## PAROCHIAL POLICIES

Planning for parking is almost entirely a municipal responsibility. Federal, state, and regional transportation plans rarely mention parking, although it is an essential and expensive part of the transportation system. As a result, parking policy is parochial. When higher levels of government do take note of the wider consequences of parking on transportation, the environment, and the economy, however, they tend to limit rather than require parking.[49] Oregon's Transportation Systems Plan, for example, requires local governments to amend their land-use and subdivision regulations to achieve a 10 percent reduction in the number of parking spaces per capita.[50] The Portland, Oregon, metropolitan government limits the minimum parking requirements that cities can impose. For example, a city's minimum parking requirement for general office buildings cannot exceed 2.7 spaces per 1,000 square feet. The metropolitan government also caps the maximum amount of parking that cities can allow.[51] If the site is transit- and pedestrian-accessible, for example, the maximum parking allowed is 3.4 spaces per 1,000 square feet. In the United Kingdom, the national government's transport policy guidelines for local planning specify, "plans should state maximum levels of parking for broad classes of development.... There should be no minimum standards for development, other than parking for disabled people."[52] These attempts to take state and regional concerns into account suggest that leaving parking policy entirely to local control produces too much parking.

Removing the requirements for off-street parking is not a "restraint" on off-street parking, because developers can still provide as much as the market will support. Some cities that remove the off-street parking requirements in their CBDs, however, switch directly to parking caps, which are a restraint. Fewer parking lots improve the appearance of the downtown, and new buildings give more reasons to visit it, but businesses are naturally concerned about having "enough" parking, and they may fear that restraining the parking supply will keep customers away. Does it? In a survey of research on whether parking restraint policies affect the economic vitality of urban centers, Ben Still and David Simmonds concluded, "There is no clear evidence from aggregate statistical studies that parking [restraint] is clearly linked to retail or other sector economic vitality.... There is very little evidence of any sort available and certainly a lack of clear evidence regarding the wider effects from parking restraint policies."[53] If restraints on the parking supply really did limit economic vitality, one would expect to find some evidence, but there is none.

In many communities, sales taxes are an important source of local revenue, and planners are thus under pressure to do "whatever it takes" to attract retail sales. The competition for retail tax base puts cities in a race to offer plenty of free parking for all potential customers. From a regional perspective, this race is a zero-sum game because more parking everywhere cannot increase the total regional sales volume. The Portland Metro's regionwide limit on parking requirements is like a disarmament treaty among local governments: because of their desire to avoid "mutually assured destruction," cities agree not to compete with each other by trying to require more parking than everyone else. A city's cap on the amount of parking may also be interpreted as a disarmament treaty among developers: they cannot compete with each other by providing more parking. Where cities reduce their parking requirements, individual developers may be willing to provide less parking if they know that all other developers will do likewise; they will save money on construction costs and also reduce the vehicle traffic generated by their projects. Parking caps arise from a recognition of the many long-term connections between traffic, land use, and urban form, while minimum parking requirements are reactive responses to local and immediate concerns.[54]

## MOBILITY VERSUS PROXIMITY

Mobility and proximity are two ways to improve accessibility—the ease of reaching destinations. In the U.S., mobility has come to mean mainly the ability to drive wherever you go and to park free when you get there. A problem with using off-street parking requirements to provide this mobility is that they reduce proximity. Abundant parking makes it easier and cheaper to drive, but pandemic parking lots spread activities farther apart, making cars more necessary. Off-street parking requirements increase mobility by car, but they also reduce mobility by walking, cycling, and public transit.[55] By reducing both propinquity and non-car mobility, the parking supply creates its own demand because a car is needed to get to most places. The increased vehicle travel also increases traffic congestion. If drivers have to fight their way through congested traffic while traveling between their free parking spaces, off-street parking requirements can both increase vehicle travel *and* reduce accessibility.

Transportation economists Jonathan Levine and Yaakov Garb explain how pursuing the goal of mobility can reduce accessibility:

> The derived nature of transportation demand implies that enhancement of mobility per se is not a reasonable goal for transportation policy.... "Mobility" is defined here as ease of movement; accessibility is defined as ease of reaching destinations. The concepts are related but readily distinguishable. Where destinations are close by, greater accessibility can be afforded even if mobility is constrained; where destinations are remote, mobility may be high without high-level accessibility.[56]

Similarly, Robert Cervero says, "Planning of the automobile city focuses on *saving time*. Planning for the accessible city, on the other hand, focuses on *time well spent*."[57]

Once implemented, parking requirements start a vicious cycle. Parking spaces and cars are complements, which means that free parking increases the demand for cars, and more cars in turn increase the demand for parking. Off-street parking requirements and cars therefore present a symbiotic relationship: the requirements lead to free parking, the free parking leads to more cars, and more cars then lead to even higher parking requirements. When 3 spaces per 1,000 square feet no longer satisfy the peak demand for free parking, a stronger dose of 4 spaces per 1,000 square feet can alleviate the problem, but not for long because cars increase in numbers to fill the new parking spaces. Every jab of the parking needle relieves the local symptoms, but ultimately worsens the real disease—too much land and capital devoted to parking and cars. Parking requirements are good for motorists in the short run but bad for cities in the long run.

## SYSTEMWIDE EFFECTS OF PARKING REQUIREMENTS

Almost everyone in the U.S. now leads a lifestyle adapted to the car and ubiquitous free parking. As a result, the demand for parking is now higher than it would be if cities had never required on-site parking. Therefore, we cannot estimate how the whole *system* of parking requirements increases the parking supply simply by looking at the difference between the number of spaces that cities require and the number that developers now voluntarily provide because developers are responding to a level of demand that has already been inflated by the prevalence of free parking. The difference between the required and voluntary supplies of parking at each individual site therefore underestimates the systemwide effects of minimum parking requirements.

To see why the increase in the total parking supply is greater than the sum of its parts, consider two hypothetical cases for the development at one site: first, no parking requirements at this site alone, and second, no parking requirements anywhere. In the first case, only the individual site is exempt from parking requirements, and every other site in the city must provide all the required parking. In the second case, the city has never required on-site parking anywhere, and developers have always provided only the number of parking spaces they thought were worth the cost. Although the site is not subject to off-street parking requirements in either case, a developer will voluntarily provide more parking spaces in the first case—to compete with all the other buildings that offer plentiful free parking—than in the second case.

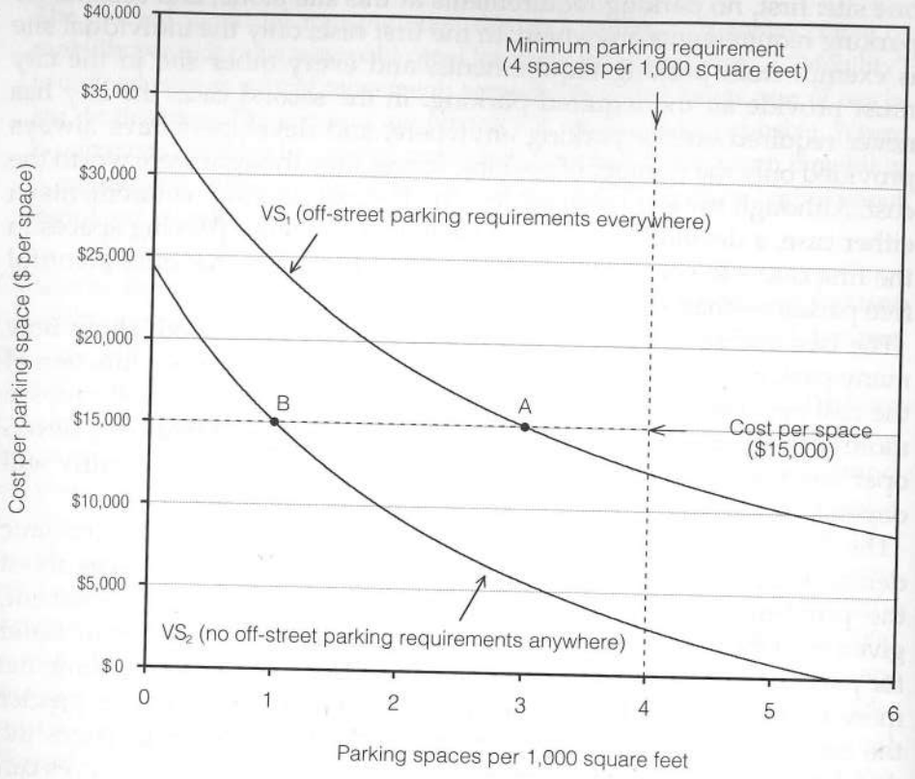
The two curves in Figure 3-2 illustrate the two cases. Both show how many parking spaces a developer will *voluntarily* provide as a function of the cost per space. If parking spaces cost less, the developer will provide more of them, so the curve slopes downward. A profit-maximizing developer will voluntarily provide some parking spaces, but the quantity will depend on the cost.

The VS curve is not a typical supply curve in a traditional economic demand-supply diagram. Instead, it shows the outcome of choices about the profit-maximizing number of parking spaces for a development, given both the cost of providing parking spaces and the expected demand for parking in the development. The greater the demand for parking, the more parking spaces the developer will voluntarily supply; the greater the cost of providing the parking spaces, the fewer parking spaces the developer will voluntarily supply. The downward-sloping VS curves can thus be thought of as the developer's own demand for parking spaces.

First consider the upper curve, $VS_1$, which shows the number of parking spaces a developer will *voluntarily* provide if the city requires at least 4 spaces per 1,000 square feet everywhere else. We can use this curve to examine how a prevailing requirement of 4 spaces per 1,000 square feet increases the parking supply at *this site*. Because the requirement applies at all other sites in the city, parking is free everywhere else, nearly everyone has a car, and everyone expects to park free wherever they go. This market environment increases the developer's willingness to provide on-site parking (depending on its cost), as shown by the upper curve, $VS_1$. Suppose the cost to provide parking at this site is $15,000 per space. In this case, the developer will voluntarily provide 3 spaces per 1,000 square feet (point A), which is 1 less than the city requires. The requirement therefore appears to increase the parking supply by only 1 space per 1,000 square feet.

Now consider the second case in which the city has *never* required parking anywhere. Most buildings would have fewer spaces, and urban den-

**Figure 3-2. Voluntarily Provided Parking Spaces as a Function of the Cost per Space**




sity would be higher. With higher density, more travelers would ride public transit, cycle, and walk, and they would own fewer cars. This different market environment reduces the developer's willingness to provide on-site parking (which is not required), as shown by the lower curve, $VS_2$. In this case, if the cost of parking is again $15,000 per space, the developer will voluntarily provide only 1 space per 1,000 square feet (point B).

The individual developer's behavior *seems* to suggest that requiring 4 spaces per 1,000 square feet increases the parking supply by only 33 percent (from the voluntary 3 spaces to the required 4). But the parking requirement had already altered urban form, increased the number of cars, and oriented travel habits toward solo driving. As a result, the requirement really increases the parking supply by 300 percent (from the voluntary 1 space to the required 4) because the market would supply only 1 space per 1,000 square feet if the city had never required off-street parking.[58]

This hypothetical example illustrates two important points. First, we cannot estimate how parking requirements increase the parking supply without knowing how much it costs to provide parking spaces. If parking spaces are not expensive, parking requirements may not increase the parking supply at all because developers may voluntarily provide the required spaces. But if parking spaces are expensive, the requirements can greatly increase the supply. Second, we cannot look at the current behavior of individual developers to estimate how the whole system of requirements has increased the parking supply. An individual developer may voluntarily provide all the parking required at a site, but this decision is in part due to the free parking everywhere else. Therefore, the whole system of requirements increases the parking supply beyond what the market would provide, even if many developers voluntarily provide all the spaces required at their individual sites.

If a city removes its parking requirements, land use will not snap back to what it would have been if the city had never required off-street parking. Urban form is "path dependent," and cities that cease to require off-street parking may never resemble cities that never required it. The engineer's term for path dependency is "hysteresis," which refers to the failure of a property that has been changed by an external agent to return to its original value when the cause of the change is removed. Even if a city removes its parking requirements, most parking will remain free in the short run because the capital stock is long lived. In the long run, however, no cost is fixed, and nothing is free: without off-street parking requirements, the price of parking will rise toward the cost of providing parking spaces. Post-parking-requirement cities will become more compact and less automobile dependent over time. Automobile dependency resembles addiction to smoking, and free parking is like free cigarettes. More people would get into the habit of heavy smoking if cigarettes were free, and their addiction would be hard to break even if the subsidies for smoking were removed. Likewise, automobile dependency will also be a hard habit to break even if parking subsidies are removed. Cities will adjust slowly to the removal of parking requirements because new development will occur in the midst of a largely car-oriented society. Off-street parking requirements have cemented many planning mistakes into the built environment, and it will take decades for cities to recover from the damage.

## PARKING SPACES REQUIRED FOR A CHANGE OF LAND USE

Parking requirements severely restrict the use of older buildings. For example, if a building has 2 parking spaces per 1,000 square feet of floor area, most cities will not allow it to be converted to a new use with a

requirement of more than 2 spaces per 1,000 square feet unless more parking spaces are added or a variance is obtained. Adding new spaces to an older building is usually out of the question because there is simply no room. Older buildings are thus limited to uses for which the existing parking supply meets the current parking requirements.

The restrictions on building use become especially severe after a city increases its parking requirements. The new requirements do not apply retroactively to existing buildings in their current uses, but the parking supply becomes "nonconforming" at buildings that do not have enough spaces to meet the new requirements. Cities grant these nonconforming buildings a "grandfather" right to continue doing business in their current use with their existing parking supply, but they can require additional spaces to be added if the use changes.[59] (A grandfather clause in a statute exempts those already involved in a regulated activity or business from the new regulations established by the statute.) Parking requirements triggered by a change of use severely limit the possible occupants for older buildings and stunt the economic development of older areas.

### Two Policies

Cities have two common policies about the number of parking spaces required when a building's use changes, and both limit the use of older buildings.[60] These two policies can be explained by examining the zoning ordinances of two California cities: Long Beach and San Diego. What happens when a building is converted to a new use that has a higher parking requirement than the existing use?

## Parking Spaces Required When A Use Changes

A use with nonconforming parking may change to another use without adding parking [unless] the new use would require more parking than the existing use. Then, in order to establish the new use, the applicant must add parking equal to the difference between the parking requirement of the existing use and the new use (net change in parking intensity).

*Long Beach, California, Municipal Code Section 21.27.070C.*

When a change of use is proposed to a use that requires the same or fewer off-street parking spaces than the previous use…no change in parking spaces is required.… When a change in use is proposed to a use that requires more off-street parking spaces than the previous use, parking shall be required as provided in this division for the new use.

*San Diego, California, Municipal Code Section 142.0510(d).*

1. Long Beach requires adding enough parking spaces to meet the difference between the parking requirements for the existing and the new uses.
2. San Diego requires adding enough parking spaces to meet the parking requirement for the new use.

Table 3-5 illustrates these two cities' policies in the case of a 1,000-square-foot building that has no off-street parking spaces because it was built before the city required parking (column 1). In both cities, the current requirement for the building's existing, grandfathered use is 2 spaces per 1,000 square feet (column 2). Suppose the owner wants to establish a new use for this building. We can examine how many additional parking spaces each city requires when the current requirement (in column 3) for the new land use is 2 spaces per 1,000 square feet (Scenario A) or 3 spaces per 1,000 square feet (Scenario B).

In Scenario A, where 2 spaces are required for both new and existing uses, neither city requires more parking, and the requirement does not prevent changing the building's use. Next consider Scenario B, where 3 spaces are required for the new use. Long Beach requires 1 new space to meet the difference between the requirements for the new use (3 spaces) and the existing use (2 spaces). San Diego, however, requires 3 new spaces because the building must meet the requirement for the new use. Both policies hobble reuse, but San Diego's more stringent policy raises a higher barrier.

Zoning consultant Charles Reed recommends reducing the number of uses with different parking requirements to as few as possible, so that most new uses will have the same requirement as the old one.[61] This uniformity will make older buildings easier to reuse. Because most retail establishments lease their quarters and are prone to a high failure rate, securing loans to build or remodel a building may be difficult unless the space is adaptable to other uses at a low cost, without the need for additional parking spaces.

**Table 3-5. Parking Spaces Required When a Building's Use Changes**

| | Existing parking spaces | Spaces required | | Additional spaces required for a change of use | |
|---|---|---|---|---|---|
| | | Existing use | New use | Long Beach | San Diego |
| | (1) | (2) | (3) | (4) | (5) |
| A | 0 | 2 | 2 | 0 | 0 |
| B | 0 | 2 | 3 | 1 | 3 |

For an existing building of 1,000 square feet.

Long Beach and San Diego clearly state the number of parking spaces required when a land use changes, but some cities' zoning codes are vague or even silent on this issue, and many planners cannot explain their city's policy. Some cities appear to have an even more stringent policy: they require each new use to meet the city's current parking requirement for the new use, even if it is the same or lower than that for the existing grandfathered use. For example, suppose a building with no parking has an existing grandfathered use with a requirement of 3 spaces per 1,000 square feet. An owner who wants to convert the building to a new use with a requirement of only 2 spaces per 1,000 square feet must meet the requirement for the new use even though it is lower than that for the existing grandfathered use.

The change-of-use rules refer to buildings that have a grandfathered right to operate with the parking supply for the previous use. But a building that has been unoccupied for a specific time (one year in Long Beach, two in San Diego) loses its grandfathered rights and must meet the current parking requirement before any new use can be established. A building that has been vacant for more than a year or two can thus become extremely difficult to reuse. Someone who wants to reoccupy the building even in its previous use must provide all the parking spaces currently required for the use. This counterproductive policy works against revival: once an area has been neglected for a few years, parking requirements make adaptive reuse even more difficult, and older buildings must be adaptable to survive.

### An Example

An example can explain how parking requirements prohibit many desirable land uses. Suppose an existing warehouse has no off-street parking because it was built before the city required any. The city now requires a warehouse to provide 1 space per 1,000 square feet. Although the building does not conform to the current requirement, it can continue to be used as a warehouse without providing the required parking because the use was established before the city imposed the current requirement. If the current occupant goes out of business, the building can be reused as a warehouse without providing the required parking because there is no change of use.

Suppose also that the parking requirement for a research laboratory is 3 spaces per 1,000 square feet. Because the requirement for a research laboratory is higher than for a warehouse, the warehouse cannot be converted into a research laboratory without providing more parking spaces or seeking a variance.[62] Long Beach requires 2 new spaces per 1,000 square feet, and San Diego requires 3. Parking lots have about 330 square feet per space, so 3 spaces per 1,000 square feet of a building's floor area produce a parking lot about the size of the building itself. Because adding new parking spaces to most older buildings is impractical, parking requirements in zoning ordinances can freeze buildings in their existing land uses or even prevent any feasible use.

In summary, off-street parking requirements have different meanings for new buildings and for existing buildings. For a new building, parking requirements determine the number of spaces that a developer must supply. For an existing building, parking requirements limit the uses that a city will allow. Given the haphazard methods planners use to set parking requirements, many important land-use decisions are made with no rational basis.

## QUANTITY VERSUS QUALITY

Architects and urban designers have published several excellent guides to better design of parking lots and structures, including Mark Childs's *Parking Spaces*, Jim McCluskey's *Parking: A Handbook of Environmental Design*, Catherine Miller's *Carscape*, and Thomas Smith's *The Aesthetics of Parking*. But despite many good "parkitecture" proposals, most design is dismal because the sheer number of parking spaces required by zoning leaves little room or budget for anything other than asphalt lots and blank structures. PAS has published five surveys of cities' requirements for the *number* of parking spaces, but only one survey of cities' requirements for the *design* of parking spaces.[63] Andres Duany, Elizabeth Plater-Zyberk, and Jeff Speck explain the problems caused by zoning's fixation on numbers and ratios rather than on design:

> The problem with current development codes is not just their size.... They have no images, no diagrams, no recommended models, only numbers and words. Their authors, it seems, have no clear picture of what they want their communities to be.... Most zoning codes, focused on numbers and ratios rather than on physical form, can't tell the difference between a dingbat and a block of row houses, as they seem to be statistically identical.[64]

Planners focus almost exclusively on the ratio of parking spaces to floor area, and they neglect how all the required parking spaces affect urban design. Off-street parking requirements represent the triumph of quantity over quality in urban planning. Planners should stop requiring more parking *spaces* and start requiring better parking *design*.

Parking lots are often asphalt eyesores that interrupt the streetscape and expand the distances between destinations. Thomas Smith, in PAS Report No. 411, says:

> Visually, parking lots and parking structures can be a mess. They are often too big, contain too much asphalt or concrete, and have little or no relationship to the buildings and activities around them. They are not inviting places for pedestrians, and they do not have the interest or attraction of other urban open spaces. The size and scale of parking lots and parking garages cause them to break up the links between buildings and destroy the continuity of some streetfronts.... All too often, however, planners give no attention to improving the appearance of parking lots.[65]

As a result, visitors must walk through a maze of vehicles in a desolate, oil-stained parking lot before finally arriving in a sparkling, marble-veneered lobby. And beyond being ugly themselves, the required parking spaces can disfigure the design of buildings they serve. Fitting both a building and the required parking onto the site can be difficult, and the building's design often must be compromised to accommodate the parking. Architects often complain about the need to shoehorn a building in after the parking requirement has been satisfied. Removing off-street parking requirements can therefore increase the potential for better design. Planners can then use zoning more creatively to improve the design of parking itself. To illustrate this potential, I will give four examples of how zoning for parking can significantly improve urban design:

1. Limit the number of parking spaces
2. Improve the appearance of residential garages
3. Improve the location of parking
4. Improve the design of parking structures

### Off-Street Parking Limits

As Berkeley professor Allan Jacobs observed, often in city planning "it's not what you see that says it's a good job..., its what you don't see."[66] Carmel, California, provides a fine example of parking that you don't see. Carmel is famous for its attractive downtown, and zoning helps explain its unique pedestrian ambience. To achieve this ambience, the city *prohibits* off-street parking spaces anywhere in the central commercial district. The zoning ordinance states:

> On-site parking is prohibited in the central commercial (CC) land use district. This policy reduces the need for curb cuts in sidewalks and the interference with free pedestrian traffic flow that would result from an excessive number of driveways. This policy is intended to enhance the opportunities for creating intra-block courts and walkways between properties and buildings.[67]

Carmel does have parking requirements, but developers in the central commercial district must pay fees in lieu of the required spaces; that is, Carmel simultaneously requires *and* prohibits off-street parking, and it collects in-lieu fees for the required-but-prohibited spaces. The city then uses the revenue to finance shared public parking spaces on the periphery of the downtown.[68] The *absence* of off-street parking helps make the center of Carmel one of the best places in America to be a pedestrian, and people from all over the world come to stroll its sidewalks.

Most cities will probably not want to prohibit *all* off-street parking in their centers, but they can take the intermediate step of taxing or prohibiting *surface* parking.[69] Restricting off-street surface parking to improve pedestrian ambience accords with the views of Berkeley professor of architecture Christopher Alexander, who argued that too much land for parking degrades the environment. In *A Pattern Language*, Alexander says:

> When the density of cars passes a certain limit, and people experience the feeling that there are too many cars, what is really happening is that subconsciously they feel that the cars are overwhelming the environment, and that the environment is not a place for people.... The effect of the cars reaches far beyond the mere presence of the cars themselves. They create a maze of driveways, garage doors, asphalt and concrete surfaces, and building elements which people cannot use. When the density goes beyond the limit, we suspect that people feel the social potential of the environment has disappeared.[70]

Alexander speculates that no more than 9 percent of the land should be devoted to parking, and most pedestrians probably do feel the less parking, the better. Many other designers have also deplored the deadening effects of excessive surface parking, and the few who embraced the automobile tended to ignore the parking problems their designs would cause. Le Corbusier and Frank Lloyd Wright, for example, usually illustrated tall buildings surrounded by parks, while in reality they were surrounded by parking lots.[71] In describing the enormous influence of Corbusier's high-rise fantasies, architect Moshe Safdie says:

> In the *City of Tomorrow* (1929), Le Corbusier wrote, "The center of the great city is like a funnel into which every street shoots its traffic..." and concluded that, "wide avenues must be driven through the centers of our towns," presaging countless downtown highway projects carved right out of the historic meeting places of busy streets, commerce, and civic institutions. "We must create vast and sheltered public parking places where cars can be left during working hours," he suggested, enthusiastically describing one of the most widespread and drastic influences on the shape of cities for years to come. It would take

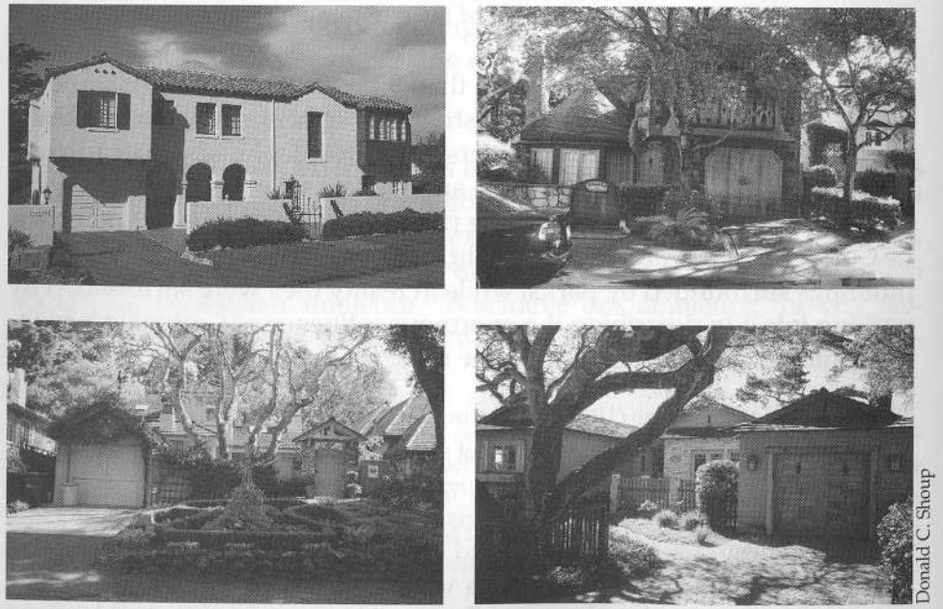
> the passing of a full generation before a new group of younger architects... came to appreciate that the Modern movement had entirely overlooked what had been a fundamental component of urban life: the pedestrian.[72]

Much damage has to be undone, and limits on off-street parking are one way to start.

### Garage Door Restrictions

In its residential areas, Carmel has another simple but effective zoning ordinance that reduces the impact of parking on the streetscape. If a house has a garage that faces the street, the garage door cannot be wider than one car.[73] As a result, garage doors cannot dominate the fronts of houses, and the city therefore appears to be designed for people rather than for cars. Figure 3-3 shows some of the resulting facades. The one-car garage doors contribute to, rather than mar, the overall design of houses and the street.

Other cities also have zoning provisions to improve the residential garagescape. Olympia, Washington, requires that garage sidewalls facing the street should appear as habitable space, through the use of windows or other design elements. Portland, Oregon, limits the length of the garage wall facing the street to no more than 50 percent of the entire building



Donald C. Shoup

**Figure 3-3. Carmel, California, requires that garage doors do not exceed one car width**

facade.[74] New Jersey requires cities to calculate the number of off-street parking spaces in a way that reduces the garage frontage. A one-car garage and driveway combination count as two parking spaces if the length of the driveway is at least 18 feet between the face of the garage door and the right-of-way.[75] Developers can thus satisfy a two-space requirement with a one-car garage and cut by half the street frontage required for garage doors.

### Parking Location Requirements

Restrictions on the location of parking can also improve the street frontage. Consider how the zoning ordinance in SeaTac, Washington, prevents parking lots from degrading the urban design and pedestrian ambience of commercial districts:

> No parking shall be located between the building and the front property line. On corner lots, no parking shall be located between the building and either of the two (2) front property lines.[76]

This requirement puts on-site parking spaces either beside or behind buildings, rather than in front.

In his PAS Report on how to prepare zoning ordinances, Charles Lerable shows how the placement of parking lots can influence, for better or for worse, the pedestrian quality of the streetscape (see Figure 3-4). In the top panel, the parking is placed between the building and the sidewalk, a common pattern for mini-malls and strip shopping centers. The middle panel shows the parking beside buildings, which reduces the amount of frontage devoted to parking but still leaves gaps between buildings. The bottom panel shows the parking lots placed behind buildings, so that the only gap between shops is the access to the parking.

Urban historian Richard Longstreth has written extensively about how cars and parking transformed commercial space in Los Angeles in the first half of the twentieth century.[77] Longstreth does not mention off-street parking requirements (Los Angeles did not begin to require off-street parking for commercial buildings until 1946), but he explains that merchants placed a high value on sidewalk orientation even as they voluntarily began to provide parking spaces. For this reason, developers commonly placed parking behind buildings:

> Wilshire Boulevard set the standard for countless smaller retail precincts of the region during the 1930s and 1940s. Planned shopping centers developed during this period maintained a sense of street-front drama by adhering to the pattern of showing facades and offering rear parking. Such complexes were often conceived and operated more as an agglomeration of stores than as a

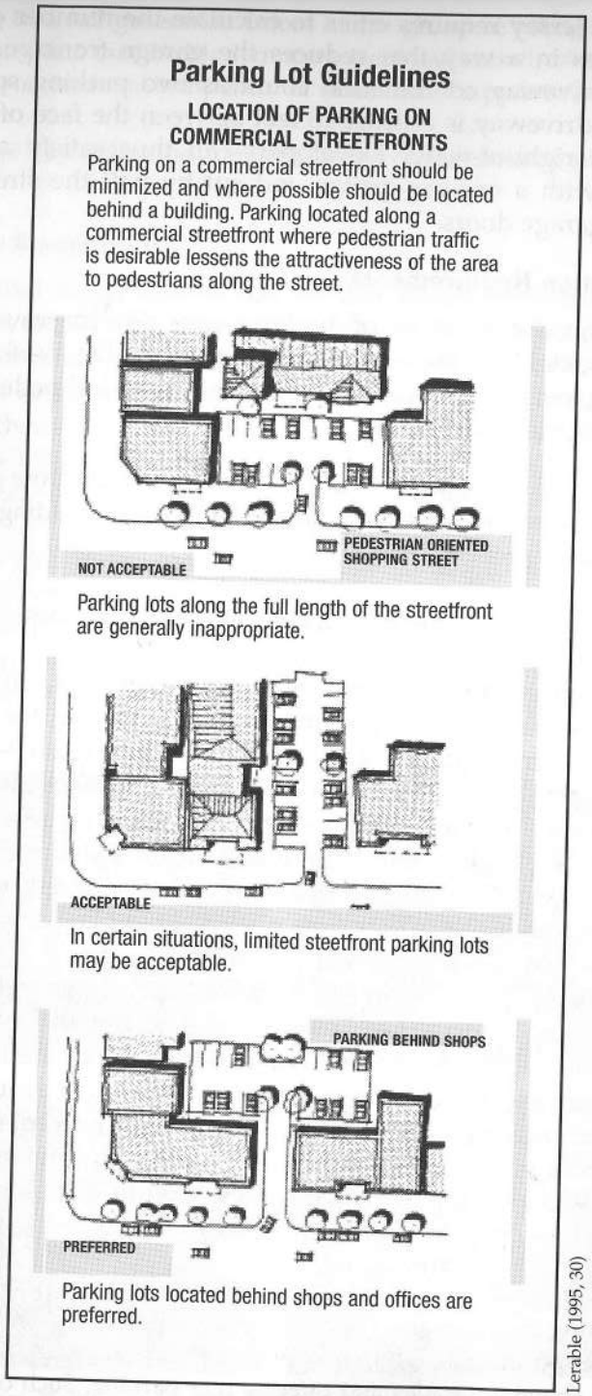



**Figure 3-4. How parking lot placement can influence the pedestrian quality of streets**

fully integrated facility. On the whole merchants showed a persistent reluctance to abandon their traditional sidewalk orientation. Food retailers whose supermarkets formed the anchor units of these centers were especially adamant on the matter.[78]

Los Angeles was not unique in this regard. University of Pennsylvania professor of urbanism Witold Rybczynski says that this rear-parking pattern was present in the earliest shopping centers that were developed as part of master-planned communities:

> Market Square [in Lake Forest, Illinois] and Country Club Plaza [in Kansas City, Missouri] consciously recalled small-town shopping districts in the intimate, almost domestic scale of their architecture and in their layouts—the stores faced the street and the parking lots were in the rear. This was not accidental. The developers of the shopping village were also the developers of the surrounding residential areas, and retail stores were designed to fit into the overall master plan.[79]

In outlying areas that were not part of a master plan, however, parking gradually migrated to the fronts of buildings. In 1937, Douglas Haskell observed in the *Architectural Record*, "Los Angeles appears to the casual view as a series of parking lots interspersed with buildings.... These parking lots are functionally as indispensable to the city as a car is to the citizen."[80] (The cars made the parking lots indispensable, and the parking lots, by spreading the city out, made the cars indispensable.) In 1951, two shopping center architects noted about Los Angeles, "A car has become as essential as a pair of shoes, with significant results upon business."[81] In his history of American roadside architecture, Chester Liebs says that strip developers started out by relying on curb parking, and then began setting buildings back a car length to provide perpendicular parking in front of the stores. They finally abandoned pedestrians to make life even more convenient for motorists; they paved vacant lots and put buildings at the rear of their property. "The long-standing tenet of Main Street commercial site planning—line the shops along the sidewalk with room for parking only at the curb—was finally cast aside."[82]

When parking is *behind* a building, pedestrians can see into the store windows as they walk by, and they can easily wander in. If parking is in *front* of a building, however, pedestrians cannot see what the store has to offer. Pedestrians must approach the store by walking through the parking lot, which is uninviting, even hazardous. If *all* parking is in front of buildings, few pedestrians have any reason to use the sidewalks. Duany,

Plater-Zyberk, and Speck say that placing the parking lot in front sends a rude message to the neighborhood:

> The presence of the parking lot in front of the building, in addition to damaging the pedestrian quality of the street, gives the signal that the store is oriented less toward its local neighbors than toward strangers driving by.[83]

With parking lots in front of every store, the important customers are drivers. Drawing pedestrians into a store is not an important goal because there are no pedestrians.

The location of residential parking can also be greatly improved. In Britain, the Department of the Environment's design guidelines recommend that off-street parking should not interrupt the street facades of housing and that cars should be parked either beside or behind residences. Moreover, off-street parking space should be designed for flexible uses so that it can be converted to a patio or garden if residents do not use it for parking.[84]

Cities would have continued adjusting to cars even without off-street parking requirements in zoning ordinances, but the advent of these requirements for a large parking supply at every site surely accelerated and exaggerated the migration of parking spaces from the rear to the front of buildings. Cities would be in much better shape today if urban planners had regulated the *location* rather than the *number* of off-street parking spaces during the last century.

### Parking Structure Design Requirements

Drivers choose among parking spaces for their convenience, location, and price, not for their architectural style, urban design, or aesthetic fit into the neighborhood. Developers therefore often neglect the architecture of parking structures and instead make them as cheap as possible. For this reason, cities should regulate the design of parking structures to ensure that they do not disfigure the street. Only to the extent that the appearance of a parking structure increases the value of the residential or commercial building it serves will most developers voluntarily spend money to improve its design. Parking structures, even more than other buildings, need design review.

The blank walls of parking structures degrade the pedestrian ambience of a street, and the structures themselves are often ugly, although they needn't be if architects are given the chance to treat them like real buildings and not just a cheap way to store unneeded cars. Consider, for example, the new parking structure at the Milwaukee Art Museum, with its arches and clerestory windows; its architect, Santiago Calatrava, explained:

> The parking lot is the place where 90 percent of the people arrive today. You have a right to expect quality from the earliest moment you enter the gate. I think any parking lot has the potential to be a place of welcoming, of gathering. We have to re-dignify such spaces.[85]

To improve the streetscape, some cities require parking structures to include retail space and architectural features facing the street. Consider this requirement in San Diego's CBD:

> All parking that is incidental and associated with a project shall be enclosed and architecturally integrated into the structure.... At least fifty percent (50%) of the street wall of any project or structured parking, excluding vehicular access areas, shall include street level [retail/commercial] uses.[86]

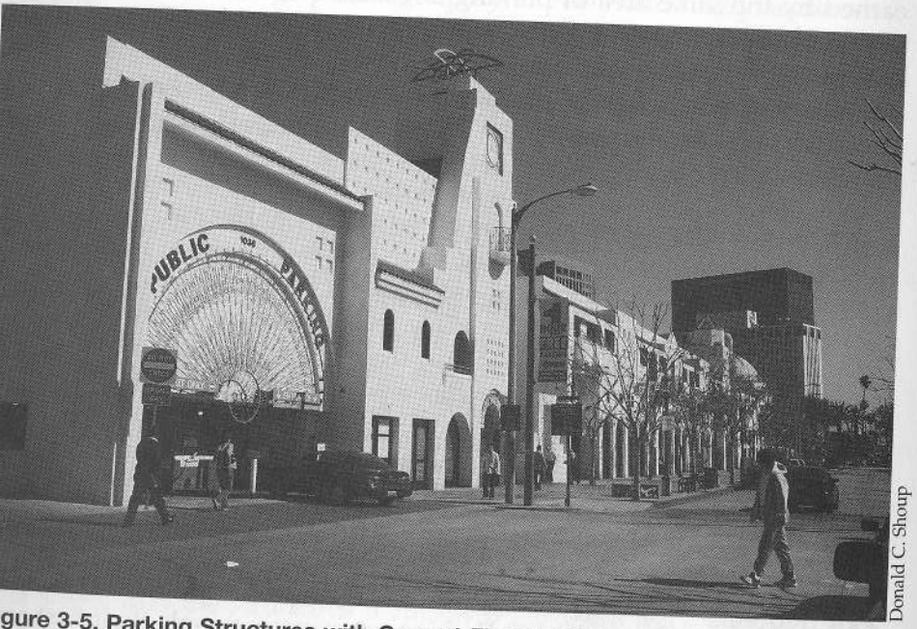
New Urbanist architect Peter Calthorpe has shown how parking structures with ground-floor retail can provide visual interest, safety, and shelter for pedestrians.[87] Some parking structures with street-level stores are so well designed that pedestrians don't even notice that they are parking structures, and the rent for the retail space exceeds the rent that would be earned by the same area of parking. Figure 3-5 shows two examples of parking structures that enhance rather than degrade the quality of life on the street.[88]

A step beyond including ground-floor retail is to "wrap" a parking structure with retail or other uses. This is particularly appropriate for transit-oriented developments, as ULI explains:

> In place of the typical suburban sea of surface parking, creative designers can wrap a parking structure with retail shops, eateries, residences, and services, such as dry cleaners. This mixed-use approach makes the parking structure more attractive as an urban place, allows people who park there to take care of errands, makes the walk to and from the parking lot more interesting, and creates a built-in clientele for the businesses.[89]

Some developers have shown how good parking design can greatly improve the appearance of a building, and Thomas Smith of PAS says many innovations in good parking design "have been pioneered by private developers without local requirements or incentives. A broader application of design improvements, however, will require local policies that are consistently applied."[90] Parking gives many people their first and last impression of a place, and planners can do much to improve these impressions. Cities should require better parking, not more parking. Planning for parking should become more of an art and less of a pseudoscience.


Donald C. Shoup




Donald C. Shoup

gure 3-5. Parking Structures with Ground-Floor Uses



## CONCLUSION: AN ELABORATE STRUCTURE WITH NO FOUNDATION

Parking is the unstudied link between transportation and land use. Urban planners seem to assume parking requirements are a transportation issue, and transportation engineers must study them; after all, transportation engineers estimate the parking generation rates for each land use. Transportation engineers seem to assume parking requirements are a land-use issue and urban planners must study them; after all, urban planners set the parking requirements for each land use. As a result, no one is really responsible for off-street parking requirements.

Because off-street parking requirements produce free parking almost everywhere, they seem to work well, at least if free parking is the only goal. But all the required parking spaces disrupt the built fabric of the city, create underused parking lots everywhere, and degrade both the natural and the built environments. Even worse, parking requirements achieve this effect by hiding the cost of parking in higher prices for everything else. Admittedly, we all want to park free, but we also want to reduce traffic congestion, energy consumption, and air pollution. We also want affordable housing, efficient transportation, green space, good urban design, great cities, and a healthy economy. Unfortunately, ample free parking conflicts with all these other goals. If our real problem is too many cars rather than too few parking spaces, minimum parking requirements make everything much worse.

Off-street parking requirements are embedded in an elaborate structure of laws, permits, fees, variances, and political compromises. They have been incorporated into every city's zoning code and have been interpreted in many court cases.[91] These requirements have put the parking supply on automatic pilot: all new development routinely comes with abundant free parking, as if it were predestined, just as everything in the Emerald City looked green because everyone was required to wear green spectacles. Once planners set the requirements, they no longer have to think about the parking supply again. But these requirements do not emerge from strategic planning that considers urban design, land use, transportation, and the environment. Most planning for parking amounts to no more than a shopping list of requirements for every land use, and most research on parking amounts to little more than simple inventories. Off-street parking requirements are an elaborate structure with no foundation.

## CHAPTER 3 NOTES

**1.** Williams and Taylor (1986, 4).

**2.** "Religious Rites Welcomed; Parking Rights are Thornier," *New York Times*, March 29, 2004. The controversy has led to a proposal to base the parking requirement for houses of worship on the maximum allowed occupancy of the largest room in the building, as determined by the Fire Department and the Department of Buildings. Orthodox Jews, who walk to synagogue on the Sabbath and holidays, have argued that they don't need any parking spaces.

**3.** In describing their study of parking requirements in Montgomery County, Maryland, for example, Steven Smith and Alexander Hekimian (1985, 36) say, "employee density is the most important variable in determining the peak parking demand for office buildings.... Serious difficulties exist, however, in predicting the total number of employees in advance (particularly for speculative multitenant buildings) and in assuring that those totals will not change significantly in the future. For those reasons, the study recommended a standard based on square footage."

**4.** An earlier survey by the Highway Research Board (1955, 20-22) found a similarly confusing array of parking requirements for funeral parlors. Almost every one of the 38 surveyed cities had a different requirement, and they had a few extra bases for the requirements not mentioned in the 1971 PAS report: assembly rooms, mortuaries, parlors for 100 or more persons, principal auditoriums, and slumber rooms. One city required a 30-foot setback for parking, and another city required 35 feet; rather than require the parking to be placed in back of the funeral parlors, the cities thus required it to be in front.

**5.** Cervero (1988).

**6.** Garreau (1991, 119). Parking must not only be ample but also convenient to satisfy some cities. Regarding a developer's request to put some spaces on the roof at a Lowe's home improvement store in Framingham, Massachusetts, for example, the Planning Board Vice Chairwoman expressed concern that many customers would "live park," meaning they would leave their cars running if they could not immediately find a parking space, rather than go all the way to the roof to find one. "The way people are," she said, "we know they'd drive through the front door if they could" (*MetroWest Daily News*, Framingham, Massachusetts, September 1, 2004).

**7.** ITE (1987a, 104).

**8.** Polanis and Price (1991, 32). The sample included 33 cities. The average parking requirement is 32 percent higher than the ITE parking generation rate.

**9.** See Appendix A. This parking requirement was for a 10,000-square-foot office building; the sample included 117 cities. The average parking requirement is 36 percent higher than the ITE parking generation rate.

**10.** Shaw (1997a, 37). This parking requirement was for a 10,000-square-foot office building; the sample included 71 cities. The average parking requirement is 43 percent higher than the ITE parking generation rate.

**11.** Gruen Associates (1986, pp. 4, 9, 14, and 30). The office parks were in the Philadelphia and San Francisco regions, and had an average occupancy rate of 87 percent. The average mode shares at the nine sites were 84.7 percent solo driver, 12.3 percent carpool/vanpool, 0.9 percent bike/motorcycle, 1.4 percent public transit, and 0.6 percent other. Eight of the nine parks reported that transit service was available within a five- to ten-minute walk of the site, but no firms in three of the parks encouraged transit use; 3 percent of the firms encouraged transit use in three of the parks; 42 percent of the firms encouraged transit use in one California park because of environmental protection regulations. Gruen's analysis of the parking data led to the conclusion that "a parking ratio of about 1.8 [spaces per 1,000 square feet] would provide an adequate number of parkwide space" to meet the peak demand for free parking (Gruen 1986, 15).

**12.** Transit Cooperative Research Program (2003b, 18-9). The average peak parking occupancy at the eight sites was 1.4 spaces per 1,000 square feet of occupied gross floor area.

**13.** Puget Sound Regional Council (2003, xi). Five earlier surveys between 1989 and 1999 found that the peak parking occupancy ranged between 73 percent and 80 percent of capacity in downtown Seattle, and between 56 percent and 64 percent in downtown Bellevue (Puget Sound Regional Council 2000, 6 and 28). Surveys at 36 employment sites in the Seattle region in 1991 found that the peak parking occupancy for office buildings was only 72 percent of capacity (Kadesh and Peterson 1994, 59).

**14.** Seattle Strategic Planning Office (2000, 14).

**15.** Gould (2003, 3). The surveys were conducted at 42 lots associated with 10 different land uses in 13 towns in Northwestern Connecticut.

**16.** Urban Land Institute (1999, 23).

**17.** Willson adjusted the observed parking occupancy upward to correspond with 95 percent building occupancy. For example, if the office-space occupancy was 50 percent, Willson multiplied the observed peak parking occupancy by 95/50 to estimate what the peak parking occupancy would be if the office-space occupancy were 95 percent.

**18.** Willson (1995, 32).

**19.** Willson (1995, 3)

**20.** Wormser (1997, 10).

**21.** Chicago Regional Transportation Authority (1998). It is sometimes assumed that chain stores demand more parking spaces than the zoning requires, but they often want to provide fewer. For a Wal-Mart SuperCenter in Michigan, for example, the parking requirement called for 1,016 spaces, but Wal-Mart applied for a variance to provide only 796 spaces, a 22 percent reduction ("Planning Commission Reviews Wal-Mart SuperCenter Site Plan," *Iosco County New-Herald*, September 9, 2003).

**22.** Levinson (1984a, 77). The average annual operating revenue was $373 per space, annual maintenance and operating costs were $246 per space, and annual debt service was $800 to $1,200 per new garage space. The average annual deficit therefore ranged from $673 to $1,073 per space. Levinson estimated that at 1983 cost levels, garage development expenses (land, construction, engineering, legal, and contingency costs) averaged $10,000 per space. He also assumed a 10 percent interest rate and a 30-year amortization period.

**23.** Car collectors require even more spaces. For example, Jay Leno uses three airplane hangers to store his collection of 80 cars and 60 motorcycles (Berg 2003, 42).

**24.** United Kingdom Department of the Environment, Transport, and the Regions (1998b, 5, 16, and 17). Blake (1999) summarizes the study.

**25.** Nozzi (2003, 50).