

Parking Planning

Carl Walker, PE, and Timothy Haahs, PE

Excerpt from The Architect's Handbook of Professional Practice, Update 2006

Given today's reliance on the automobile, incorporating vehicular parking into the built environment is essential. Creating safe, functional, pleasing, and cost-effective parking requires careful planning that draws upon special knowledge and expertise.

Today the automobile is the dominant mode of transportation in the United States, where more than 150 million passenger vehicles are in use. Despite their centrality in the U.S. transportation system, these vehicles are not in operation approximately 95 percent of the time and must be parked in various locations, including open lots, buildings in which parking is an ancillary function, or in structures dedicated solely to parking.

Architects and building design professionals can usually address the parking planning aspects of projects that must accommodate small or moderate numbers of vehicles. However, architects and their clients may seek special parking planning expertise and design assistance for projects that involve large quantities of parking or that have complexities regarding such issues as vehicular access and egress, security concerns, financial feasibility questions, and concerns about structural durability, among others.

CLIENT NEEDS

The majority of parking spaces are found on streets or in parking lots because this is the most economical way to provide parking. But in densely populated business areas (e.g., central business districts, office parks, airports, sports facilities, mixed-use complexes, retail centers, medical centers, and universities), concentrating parking in multistory parking structures—either aboveground or below grade—allows for close-in parking, protects vehicles from weather, and frees up other areas for open or green space. Parking facilities are also incorporated into large, complex structures such as those combining cinemas, shops, offices, and restaurants.

CARL WALKER has more than forty years of experience in structural engineering and parking consulting. Currently managing director of CWConsulting, LLC, he is active in the National Parking Association and other technical parking-related organizations.

TIM HAAHS formed Timothy Haahs & Associates, Inc., Structural Engineers, Architects, & Parking Consultants, in 1994. With more than twenty years of structural engineering and parking consulting experience, he sits on the board of directors of the International Parking Institute.

Summary

PARKING PLANNING SERVICES

Why a Client May Need These Services

- To analyze and evaluate a parking need or problem
- To determine the feasibility of a project with respect to parking
- To obtain expert advice during the planning and design of a parking structure

Knowledge and Skills Required

- Knowledge of parking concepts, parameters, and standards
- Knowledge of parking operations, security, and safety
- Knowledge of parking control systems
- Knowledge of construction materials (especially durability)
- Familiarity with structural concepts and systems
- Familiarity with mechanical and other building service systems
- Ability to determine financial feasibility

Representative Process Tasks

- Planning study tasks: problem definition, data gathering, data analysis and evaluation, concept development, and recommendations
- Parking facility consultation: tasks that track with traditional project delivery phases

► A parking study usually commences when the client has a parking difficulty—often when the parking demand appears to exceed the parking supply or when a developer desires to estimate demand for a proposed project.

Meeting Parking Demand

Except in large cities with well-developed, widely used mass-transit systems, parking for new developments must meet total patron demand. Even new high-rise developments in larger cities like New York, Chicago, and San Francisco have limited (usually extremely expensive) parking for building VIPs and guests.

Parking planning is an essential ingredient in master planning for medical centers; university campuses; industrial, research, and business parks; and larger community developments. Sometimes, particularly for universities, parking planning is coupled with planning for a shuttle bus system. This arrangement allows for the economical placement of parking on the perimeter of the campus, while people are shuttled to the core campus.

Community zoning codes often specify the amount of parking for designated land uses. For example, shopping centers may be required to have five parking spaces for every 1,000 square feet of gross leasable area, or office buildings may have to provide three. Land use parking ratios are frequently used to cross-check the parking demand in an area. These ratios, also called parking generation rates, can be found in a number of parking resources, including publications of the Institute of Traffic Engineers and the Urban Land Use Institute.

The combined parking demand for various land uses in an area is often higher than the actual demand. A true shared parking demand can be determined by a study of hourly parking demand requirements throughout the day for each type of land use. An example of shared parking demand is a shopping mall with office buildings on the same site. The office building parking demand will be Monday through Friday during the day, while the mall demand will be in the evenings during the workweek and all day on weekends.

Some land uses have seasonal parking demands. The peak demand in shopping centers occurs during the Christmas holiday season. Airports, although they have varying seasonal demands, must provide space to meet their peak demand, even if this includes free parking in an adjacent undeveloped field.

Central business districts are sometimes difficult to master plan because actual building development is primarily driven by real estate economics. Nonetheless, zoning regulations can require parking based on land use ratios. In downtown areas, the viability of the local mass transit system has a large effect on these ratios. True parking demand is also affected when building users seek alternative parking (e.g., remote curbside parking and lots) to avoid more expensive lots or garages adjacent to an office or commercial building. For suburban land uses where more space is available, however, parking is often provided for the total demand. This is particularly true when parking is free.

Assessing Parking Needs

Parking studies targeted to address specific issues and circumstances are used to assess parking needs. Proper data collection and analysis coupled with experienced professional judgment is best for undertaking these assessments. The traditional parking study includes analysis of parking supply and demand, site alternatives, and financial feasibility. Studies may consist of one or more of these components. Common types of parking studies are described here:

Parking supply/demand. This basic analysis provides a determination of the current and future parking supply and demand for a project. Carrying out such a study can ensure construction of the most efficient number of parking spaces, reducing construction cost and yielding environmental and land use benefits. In addition, provision of an adequate, appropriate supply of parking will increase the viability of any development. The cost of a parking supply/demand study is often less than the cost of constructing two or three parking spaces in a parking structure.

Market research. This type of study involves researching demand, available parking supply, competitive climate, and prevailing parking rates in the area where a building will be located and projecting the number of parkers the facility may capture.

Shared parking. The need for parking in mixed-use or multiuse development areas is analyzed to identify variations and relationships in parking demand generated by different land uses according to time of day, day of the week, and season of the year.

Alternative site. Possible sites for parking development are identified and compared to determine the best way to address documented parking demand. In addition to the distance of a site from the parker's destination, other factors to be evaluated include topography, geotechnical or structural foundation characteristics, and overall plan dimensions. Typically, a self-park facility requires at least two 54- to 62-foot parking modules, or a site 110 to 125 feet wide. Site length is typically 200 feet or greater. Smaller sites can be developed, but they will not be as economical.

Conceptual design. The functional design of a proposed parking facility is developed to a level of detail that communicates the project outcome to the interested parties. A conceptual design is necessary in the study phase to obtain approval to proceed with design and funding of the project.

Traffic impact. Current and future traffic volume, recommended improvements, and traffic issues generated by the proposed parking facility are analyzed in a traffic engineering report.

Financial feasibility. In this type of report, projected cash flow and methods of financing are analyzed. The development of a single stand-alone facility or a parking system that may include street parking, parking lots, parking structures, and parking fines can be studied. Subjects covered in a financial feasibility analysis include the following:

- **Estimated project costs.** Included are estimates for construction cost (hard costs), design, site acquisition, geotechnical and land surveys, testing, contingencies, and legal consulting (soft costs).
- **Cash flow.** This covers revenue, operating expense, and debt service estimates.
- **Financing.** Will the facility be privately financed with a mortgage or publicly financed using government bonds? This includes the term of the loan, interest rate, capitalized interest, and any other special, unique, or creative financing features.
- **Legal concerns.** Some legal firms specialize in public or private financing. Consultation with bonding or financing counsel regarding the nuances of long-term financing is recommended.

The most difficult part of determining financial feasibility is accurately projecting revenues. Unpredictable factors such as changes in the characteristics of parking sources can greatly affect revenues, which makes it wise to employ conservative revenue projections.

Parking access and revenue control. A determination must be made about which of a number of options will be employed to operate a particular parking facility. Curbside parking spaces on the street can be controlled with parking meters and parking enforcement personnel. Sometimes, networked multispace meters are used for revenue collection in on-street parking areas, parking lots, or parking structures.

Traditionally, many parking lots and parking structures have been controlled with exits staffed by cashiers. In this arrangement, parking fee calculations are often automated by tickets with magnetic stripes or bar codes. Automated cashiering is popular in Europe and is more frequently being incorporated in North American operations, especially in dense central business district areas. Automatic cashiering or pay-on-foot systems have many benefits, including these:

- Reduced operational costs
- Reduced risk of employee theft
- Ready compatibility with other cashiering options, such as "credit card in—credit card out"
- Greater control of validations

Electronic "space availability" systems are popular for large facilities such as airport parking structures. These systems, which employ a variety of electronic technologies, operate overhead red-green lights that identify the location of available parking spaces. The elimination of long circuitous searches as parkers look for a spot reduces unnecessary parking garage traffic, fuel consumption, and vehicle emissions and has the added benefit of reducing user frustration.

Condition audits, maintenance, and renovation. In a sense, all parking facilities are “static machines to park cars” and need periodic maintenance. Parking spaces need to be re-striped, potholes filled, lights replaced, and signage upgraded. In northern regions, parking structures are particularly susceptible to deterioration caused by deicing salts carried from the road into the parking structure. These facilities should be periodically reviewed to assess their condition and determine if repairs are required. Also, as parking facilities age, they need to be renovated to remain attractive to users. Analyses of the need for repairs and upgrades help owners maintain their structures.

Parking Structure Planning

A significant portion of urban parking is accommodated in structures, which may be located adjacent to or remote from the buildings they serve or within buildings that house other functions. Depending on specific project needs, planning for these structures may require particular technical expertise. A combination of the studies previously described may help the project team make decisions about the design and technical requirements of parking structures.

Most abovegrade parking structures have open façades to provide natural ventilation on the interior, as prescribed by building codes. Classified as open-air parking garages, these structures typically do not require mechanical ventilation or fire protection sprinkler systems (except in California). Many urban markets, such as Chicago, are placing significant emphasis on the architectural appearance of parking structures, requiring them to appear more like surrounding buildings. The resulting architectural treatment often means the garage cannot be classified as open and thus must include ventilation and sprinklers.

Due to rising land and real estate costs, parking is more often proposed and constructed as part of mixed-use projects than as traditional freestanding parking garages. Mixed-use projects may combine parking with retail, office, or residential uses where parking serves both the needs of the property users and the public. The challenge in designing mixed-use facilities is to combine the column grids and building core requirements for the different uses and still allow for a functional parking layout.

Underground parking structures usually cost between 150 and 200 percent more to build per parking space than open, aboveground structures. This added cost comes from the additional excavation, retaining walls, groundwater management, mechanical ventilation, and fire protection (sprinkler systems) these facilities require. Often, parking structures are constructed beneath a building. In these integrated garages, the column spacing is often dictated by the building structure above, which can cause inefficiencies in the traffic flow and parking space layout.

Parking structures (sometimes referred to as parking garages or parking decks) are generally classified as either “static” or “automated.” In automated parking facilities, which are more common in Europe, a vehicle is driven into an elevatorlike device that automatically deposits it into a “cubbyhole” storage slot. In static parking structures, vehicles are parked by an attendant or by the driver. The latter is the most prevalent type of parking structure in the United States.

Automated parking facilities are typically more expensive than static parking structures—both to construct and to operate. However, they can be built on narrow or small sites where it is not possible to construct functional static structures. Thus, automated parking facilities might be feasible in cities with higher parking rates, such as New York or San Francisco, and in areas where large tracts of land are not available. The system manufacturer usually executes the design of an automated parking facility, which means the primary architectural challenge is to design the exterior cladding and lobby areas.

In the early 1950s, prestressed concrete was introduced in North America. This technology made possible the design of parking structures with longer spans so the deck could clear both the parking module of a drive aisle and adjacent parking spaces without column support. These clear-span solutions eliminated the “fender bender” obstruction of intermediate columns and allowed for flexible parking space geometry as the passenger vehicle fleet changed in size over time. Many types of long-span framing systems are now available for parking structures. Structural steel, cast-in-place post-tensioned

► Today’s “open” parking structure is a unique hybrid of a building and a highway bridge, exposed to heat, cold, rain, snow, and deicing salt. Understanding this concept is key to durable parking structure design.

concrete, precast prestressed concrete, hybrid, and composite structural systems are all viable approaches for parking garage design.

SKILLS

Parking planning requires knowledge of functional design, traffic engineering, structural concepts, behavior of materials, security and safety, and parking operations. This knowledge is applicable to the various planning studies previously described as well as to consulting services for the design of parking structures.

Parking Planning Knowledge

Planning for all parking facilities requires knowledge of access control, vehicular circulation systems, and parking efficiency, as well as how parking spaces are arranged and configured. Knowledge of revenue control methods is also required so that access systems and equipment can be selected and specified.

For parking structures, knowledge about the performance and durability of structural components (particularly concrete) is especially important, along with understanding the maintenance and repair of materials, given that parking structures are intended to last as long as fifty to seventy five years.

To make parking facilities secure, parking planning can apply both active and passive security concepts and principles. In concert with security is the use of appropriate lighting and well-planned signage to direct both vehicular and pedestrian traffic. To determine the financial feasibility of parking facilities, knowledge of costs for designing, constructing, and operating such facilities, as well as the ability to estimate revenue from paid parking operations, is essential. Familiarity with ventilation systems, elevators, and drainage systems is necessary to achieve properly functioning parking structures.

Knowledge of applicable regulations including zoning and building codes that affect the design and safety of parking lots and structures is essential.

Education and Licensing

Currently, schools of architecture and engineering do not offer formal training in parking planning or parking facility design. However, several organizations provide programs that address aspects of these subjects. The International Parking Institute offers the Certified Administrator of Public Parking (CAPP) program, and the National Parking Association has the Certified Parking Facility Manager (CPFM) program. (See the “For More Information” section at the close of this topic for further information on these organizations, as well as several publications that address the subject of vehicular parking.)

► **The key to parking planning is recognizing that the parking structure is expected to provide both convenient, easily accessible vehicle storage and a means for drivers and passengers to proceed safely to their destinations, usually by walking.**

The “People” Dimension in Parking Planning

Effective parking planning recognizes how people use parking lots and structures. The parking facility is where drivers and passengers become pedestrians. Thus, the design team must realize that parking areas are used as support, secondary, or adjunct units to promote the seamless travel of parkers from their vehicles to their destinations. The objective is for drivers to find convenient parking spaces easily, park their vehicles, and walk safely to their destinations.

Vehicle-pedestrian conflicts occur in parking locations, but typically vehicle traffic moves slowly and pedestrians keep to the sides of the drive aisles. Pedestrian entry and exit points, which are usually adjacent to stair-elevator lobbies in parking structures, are located so most people will not have to walk across a vehicle entry or exit point.

Particular attention must be given to requirements of the Americans with Disabilities Act (ADA) and similar local regulations, as some states have requirements more stringent than the federal law. Some ADA spaces must be van accessible with a minimum overhead clearance of 8 feet, 2 inches. Often, parking structures are designed throughout for this clearance to eliminate height restrictions and provide a more spacious interior.

Professional licenses are not required for those who conduct parking studies and functional design consultation services. Of course, professional architecture and/or engineering licenses are required for the design and construction of parking structures.

Parking Consultants

Parking planning emerged as a discipline after World War II, when the automobile rapidly grew as the primary means of personal transportation in the United States. Many early parking consultants came from structural engineering firms that specialized in designing long-span concrete structures. More recently, consultants have come up through the ranks of established parking consulting firms or A/E firms with considerable parking design experience on larger projects. Most of these consultants have acquired their knowledge through on-the-job experience working under architects and engineers experienced in parking planning and parking facility design.

Because parking planning services are not regulated, architects and engineers can expect that a variety of firms will offer such services. For example, prior to the Enron and Arthur Andersen debacle, a number of large CPA firms, touting their alleged financial expertise, offered to perform financial feasibility parking studies. Such offerings are likely to reappear when such abuses in the public accounting field have faded from public view.

In selecting a qualified parking consultant, consideration should be given to the consultant's experience with the project type and services required, knowledge of the geographic area of the project, client references for similar projects, and experience of the project leader. In addition, the quality of work that can be expected by the consultant may be indicated or predicted by the thoroughness and quality of the consultant's proposal.

PROCESS

Most parking studies include the basic steps of defining the problem and scope, gathering data, analyzing and evaluating data, and developing solutions or concepts. Depending on the project, various combinations of parking studies may be called for. For projects involving parking structures, the parking planning process generally tracks with the traditional phases of building project delivery (e.g., predesign, design, documentation, bidding/negotiation, construction, etc.).

Progression of Parking Planning Studies

A comprehensive parking study generally follows a defined progression, with the results of one study phase becoming the input for the next study phase. For example, existing parking supply and demand comes first, then future demand, then studies of sites (with purchase costs, if any) available for future development. Following site selection, a conceptual design is developed to establish project land acquisition and construction costs. After

Scope of Work and Compensation

Establishing a scope of work for parking planning consulting services first requires the identification of the perceived parking issues and a brief discussion of ways to address parking supply shortages or design challenges. With this information in hand, the owner or the architect can request a proposal that will include a description of the services by phases or items, a work schedule, and fees. On some projects, a parking study may have cutoff points—points at which the owner may choose to end the study if, for example, a project that was to create a future parking demand is canceled.

Typically, fees for parking planning studies are driven by the amount of time required to collect and analyze data. However, when the client already has much of the required information (e.g., land use data, existing parking maps, or land maps showing areas available for additional parking), fees may be lower.

this, a financial feasibility study is completed. Throughout this progression, decisions are made regarding whether parking for excess or future demand will be provided with surface parking lots, parking structures, or a combination. Usually the financial feasibility study is the lead-in to the actual construction project.

Consultation Tasks for Parking Facility Design

The consultation process for parking structure development generally embodies the familiar project phases of predesign, design, construction documentation, bidding/negotiation, and construction. The activities and tasks involved in this process are described in the following text as they occur during these phases.

Predesign. The first step in a project is to confirm the need for and viability of a new parking facility with a comprehensive study that addresses parking supply and demand, site selection, conceptual design, and financial feasibility. Sometimes the programming has already been done in the conceptual design phase of the comprehensive study. The financial feasibility study must be accurate because it is often used as the basis for financing or bonding the project. While financing and operating cash flows can usually be projected accurately, future revenue projections are often a problem and can be a source of future financial problems. Thus, the financial projections should be done by a consultant with a great deal of experience in parking facility finances.

Design. Sometimes the schematic design and design development phases are lumped together into a preliminary design phase. At this time, the parking consultant will provide the functional design—vehicle circulation and parking space layouts. Entry and exit concepts will also be developed.

Construction documentation. Parking projects are generally developed in the same manner as conventional buildings, with contributions by the A/E team of architects, structural engineers, mechanical engineers, electrical engineers, and other specialties such as traffic engineering, landscaping, and graphics. Often a parking consultant will design the interior signage and consult regarding security, parking operating equipment, lighting layouts, and drainage locations. The structural engineer must be someone who recognizes that parking structures have unique durability requirements.

Some clients may choose to have the A/E team develop performance specifications or bridging documents, which are bid on a design-build basis. Usually these documents include drawings showing the client's preferred functional design and architectural façade. With this approach, the A/E team should maintain an advisory role with the owner.

Bidding/negotiation. Conventionally, bids are received from qualified builders. Sometimes the design-and-construction increment can be shortened by using fast-track scheduling. This can involve selection of a construction manager (CM) prior to bidding. (It is advantageous to select the CM early in the design process, as then the CM can be responsible for project budget control and provide value analysis services.)

Construction. During construction, the parking consultant should carry out tasks to help ensure the work the consulting team specified is properly executed. This includes review of shop drawing and equipment submittals, observation of construction, and job site meetings. Sometimes the final location of operating equipment is best done in the field by driving a vehicle through the area. It is wise to keep the parking consultant involved in a project through completion of the one-year warranty review.

► Parking has evolved from being considered a “necessary evil” to an important amenity in the built environment.

THE EVOLVING ROLE OF PARKING PLANNING

Many older urban areas in North America were planned in an era when workers walked to their job and when railroads and the horse and buggy were the primary means of travel. To revitalize and renew these areas, provisions for consolidated residential and business parking will be required. For nonurban surface parking, the challenge is to create well-landscaped and reasonably scaled solutions that fit within the overall project. In some suburban office park developments, clients often desire architecturally compatible parking structures to preserve green space, hide cars, and provide shelter from severe weather conditions.

Parking Facility Planning Factors

Parking structure planning involves consideration of a number of factors that affect the overall design of a parking facility:

Flexibility. Given that most new parking facilities are designed to last fifty to sixty years before major repairs and renovations are required, new parking structures should be designed to accommodate changing vehicle sizes, new methods of revenue control, and new methods of directing parkers to available parking spaces.

Functional design. The layout of circulation routes and parking spaces is the primary creative challenge in parking facility design. Traffic flow can either be one-way with angle parking or two-way with 90-degree or perpendicular parking. The choice of angle or perpendicular parking is affected by a number of factors, including the building or land use generating the parking, the parking turnover (the number of parkers using a parking space in a day), the number of bays or modules that can be developed, and site dimensions.

Vehicle circulation. In a parking structure, vehicle circulation can be via continuous ramps, express ramps, or a combination of the two. In continuous ramping, the floor is designed so vehicles drive and park on the same sloping surface. Typically, the slope for a parking ramp should not exceed 6 percent; however, slopes of up to 7 or 7.5 percent are not uncommon in central business districts where site geometries dictate higher slopes. The distance a parker is expected to circulate to find a parking space should not exceed 500 to 600 parking spaces. Larger facilities should have divided circuits. Often, parking for monthly or all-day parking is in one area or circuit, while transient or hourly parking is in another.

In larger parking structures, such as at airports, the parking floors may be level with access and egress from each level via express ramps. (*Note:* Even functionally level floors are sloped for drainage.) Express ramps, of either straight or circular configuration, can have grades of up to 15 percent or more. However, maximum slopes are usually limited to 12.5 percent because this is the maximum pedestrian ramp slope allowable in most building codes.

Typically, drive aisles are also pedestrian aisles. Lots and parking structures are laid out whenever possible with the drive aisles between the parking rows oriented so they flow toward the pedestrian destination. Sometimes pedestrian walkways across drive aisles are delineated with painted stripes.

Parking efficiency. The average area per parking space is a measure of "parking efficiency." This is determined both by the actual size of the parking spaces and by the functional design of the space.

The width needed for parking spaces varies with the size of passenger vehicles in the overall passenger vehicle fleet. In the 1980s, when gasoline prices increased drastically, automobile manufacturers downsized overall vehicle sizes both in length and width and the accepted one-size-fits-all space was 8 feet, 6 inches wide. Since then, however, the increase in wider sports utility vehicles and pickup trucks has caused some parking planners to increase the typical parking space width to 9 feet. In 2005 the 85th percentile passenger vehicle was the Ford Expedition, which is 5 feet, 7 inches wide by 17 feet, 1 inch long. This size is likely to go down in the future as fuel prices rise once again.

Whether angled parking or perpendicular parking is more efficient is the subject of an ongoing argument in the industry. Perpendicular parking requires a module—bumper wall to bumper wall—of 58 to 62 feet, with a 60-foot module (18-foot parking space plus 24-foot drive aisle plus 18-foot parking space) being the most common. Angled parking modules may be as small as 46 feet with 45-degree angled parking. Angled parking is most efficient, with modules of 52 to 56 feet in angles of 60 to 70 degrees, respectively.

Another parking design argument is whether to use "one size fits all" parking spaces or design some spaces for large cars and some for small cars. The problem with different spaces is that drivers of small cars, which easily fit into large-car spaces, may use them if the large spaces are more convenient to stairs and elevators. Sometimes, midsize or large cars use small-car spaces and block the use of a space between them. Thus, the trend has been to design "one size fits all" parking spaces with judicious use of small car spaces on the ends of parking rows to promote ease for turning.

To achieve maximum parking efficiency, parking lots are typically laid out in perpendicular parking with spaces laid out around the full perimeter of the lot. At shopping centers and malls, parking is not allowed adjacent to the buildings when this drive area is also a fire lane. In some instances, however, an angled parking layout will be more efficient than a perpendicular parking layout.

Traffic impact. Getting to and departing from a parking facility is important. The streets surrounding a planned parking facility are analyzed for the ease of accessing the facility from expressways and arterial roadways. One-way street patterns, and the possibility of changing these patterns, are also analyzed. The success of a parking facility can be compromised by failure to adequately consider the arterial thoroughfares used to access the parking facility and its entrance/exit locations.

Parking access and revenue control. The most common access route to a pay parking facility is an entry drive with a ticket dispenser and gate arm. For exiting, the ticket is given to a cashier, a cash or credit card transaction is completed, and the parker leaves. Some automated cashiering systems allow the driver to prepay at an automatic cashiering machine and then to exit by placing the prepaid ticket into a gate activator. Another system uses the same credit card to activate the entrance and exit gates, and charges the parking fee directly to the credit card account. For contract parking users, a key card or automatic vehicle identification (AVI) system may be used to gain entry and exit. In the future, it is expected that universal AVI systems will be available for use on toll roads and in parking facilities.

Security. An environment in which parkers feel secure is critical for a successful parking operation. Security can be provided in two ways—actively and passively. Personnel who periodically patrol a parking facility provide active security. Built-in elements of the structure itself can provide passive security by creating an atmosphere in which criminals feel uncomfortable plying their trade. Two essential elements for passive security are good lighting and openness (e.g., elimination of potential hiding places and views to the exterior). The Illumination Engineering Society's (IES) lighting manual provides guidelines for the proper levels of lighting in parking facilities. Openness can be provided by employing long-span construction, open stairwells, and, where allowed by building codes, glass-backed elevators.

Ventilation. Open parking structures are naturally ventilated by outside air flowing through the parking structure. Exterior façade openness requirements are established by building codes. Parking structures that do not meet these requirements, such as underground facilities, are required to have mechanical fresh air ventilation and a fire suppression or sprinkler system.

Drainage. Good drainage is necessary to maintain the durability and customer friendliness of parking facilities. Where codes allow, the use of PVC piping rather than cast iron or steel is more economical and visually acceptable. Provision of potable water to each parking structure floor is recommended for washing the facility.

Signage. Signage is an integral part of a parking environment. Signs are used to communicate directions, warnings, and other information to drivers and pedestrians, and their graphics can add architectural life to a parking facility. Other types of graphic features can also be used to create a more pleasant atmosphere for users.

To accommodate these needs of today's mobile society, planners, designers, and architects will be called upon to provide convenient and safe parking. Whether individual passenger vehicles of tomorrow will be powered by petroleum or other fuels, the need for parking planning will be with us for the foreseeable future.

“Parking Planning” was originally published in *The Architect’s Handbook of Professional Practice, Update 2006*, ©2006 by the American Institute of Architects, published by John Wiley & Sons, Inc.

The AIA provides a contract document designed especially for alternative architectural services.

B102–2007, Standard Form of Agreement Between Owner and Architect without a Predefined Scope of Architect’s Services.

AIA Document B102–2007 is a standard form of agreement between owner and architect that contains terms and conditions and compensation details. B102–2007 does not include a scope of architect’s services, which must be inserted in Article 1 or attached as an exhibit. Special terms and conditions that modify the agreement may be included in Article 8.

The separation of the scope of services from the owner/architect agreement allows users the freedom to append alternative scopes of services.

AIA Document B102–2007 replaces and serves the same purpose as AIA Document B141–1997 Part 1.

For more information about AIA Contract Documents, visit www.aia.org/contractdocs/about

May 2011 The American Institute of Architects