
PARKING SYSTEM TECHNICAL MANUAL

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Parking System Guiding Principles

The following is recommended set of program goals and guiding principles for a proposed parking system in Mammoth Lakes. These program goals and principles help to put the potential parking program structural options and funding mechanisms into perspective.

Establishment of a Parking District

“Setting the Right Course” – Defining Program Goals and Guiding Principles

The following is a preliminary set of program goals and guiding principles. The following vision and mission statements and draft guiding principles are based on a variety of other community parking programs from around the country and are intended to provide a starting point for discussion and should be refined and amended to reflect the specific needs and culture of the Town of Mammoth Lakes.

Draft Vision Statement:

“The Mammoth Lakes Parking Management Organization will strive to develop a superior, customer-oriented parking system, responding to the current and future needs of parkers, including visitors, employees, employers and property owners through active planning, management, coordination and communications.”

“The Parking Management Organization shall be considered an integral component of the community’s economic development strategies and programs”.

Draft Mission Statement:

“The Mammoth Lakes Parking Management Organization is committed to enhancing the parking experience for Mammoth Lake’s customers and stakeholders. Parking and transportation policies, planning and programs will effectively support the community’s strategic goals and objectives.”

Draft Guiding Principle Categories:

- 1. Organization/Leadership*
- 2. Customer Service Orientation*
- 3. Community and Economic Development*
- 4. Integrated Transportation/Sustainability*
- 5. Leveraging Technology*
- 6. Communications/Branding /Community Education*

7. *Program Development/Responsiveness*
8. *Information Clearinghouse/Coordinated Programs*
9. *Planning /Urban Design*
10. *Safe, Attractive & Well-Maintained Facilities*
11. *Effective Management/Accountability*
12. *Self-Funding/Accountability*

A statement better defining each the twelve draft guiding principles is provided below.

Guiding Principle # 1

ORGANIZATION/LEADERSHIP

- **The parking management program will be organized to be “vertically integrated” with responsibility for:**
 - ***Managing on-street parking***
 - ***Coordination of off-street parking***
 - ***Parking enforcement***
 - ***Parking planning and development***
 - ***Parking demand management***

Consolidating the various parking functions under a single parking management organization will establish a consolidated system that is action-oriented, responsive, and accountable with improved coordination and operating efficiencies.

Recruiting a strong leader is a key element for success. The organization leader must have strong vision and communications skills, specialized parking and planning expertise, and be capable of educating other community leaders, stakeholders and private sector partners on the importance and relevance of a strong parking management organization. Strong general management and financial program development skills are also required.

Guiding Principle #2

CUSTOMER SERVICE ORIENTATION

- **Parking will support the downtown as a desirable destination for businesses, shopping, dining, and recreation by making parking a positive element of the overall downtown experience.**

The parking management organization will strive to develop and coordinate private and publically owned parking facilities that are clean, convenient, safe, and secure for both the general public and their staff.

Parking enforcement program staff will present a friendly and professional appearance and receive on-going customer service and downtown ambassador training.

The parking program will be responsive to community needs, open to fresh ideas and be actively engaged in community planning and events.

Management of the parking system will ultimately be enhanced through investments in new technology and a strong focus on customer friendly parking policies.

Guiding Principle # 3

COMMUNITY & ECONOMIC DEVELOPMENT

- **The parking system will be guided by community and economic development goals and adopted policy directives that are the result of collaborative processes between parking management organization staff, other agencies and involved stakeholders.**

The parking management organization will use its resources to promote mixed-use and shared-use parking strategies as well as promoting alternative transportation modes through the creation of incentives, partnerships and programs to attract private investment; this will include reviewing and updating existing city parking requirements, as appropriate.

Guiding Principle # 4

INTEGRATED TRANSPORTATION/ SUSTAINABILITY

- **The Parking Management Organization will support the Downtown Main Street Plan to promote a “Park Once” concept and a balance of travel modes, including bus, vehicular, bicycle and pedestrian, to meet community-wide access goals.**

The parking management plan will promote a “park once” strategy that uses parking supply efficiently and emphasizes “linkages” to other forms of transportation. “Green” strategies that can result in more efficient use of parking facilities and provide other benefits, including reduced congestion, improved transportation choices, more efficient land use, and improved streetscape aesthetics will be explored and supported.

Guiding Principle # 5

LEVERAGING TECHNOLOGY

- **The Parking Management Organization will be an early adopter of technology solutions to enhance customer service and enhance parking program efficiency and effectiveness.**

A key goal is to make parking less of an impediment to visiting Mammoth Lakes and more of an amenity. Technology will be leveraged to streamline and simplify access to parking and will be a key parking management strategy. Another key technology related goal is to enhance the efficiency and effectiveness of parking management staff and programs.

Guiding Principle # 6

COMMUNICATION/BRANDING/COMMUNITY EDUCATION

- **Parking management programs and facilities will be developed to function as a positive, marketable asset for downtown.**

One major goal of the parking management organization is to create a well-branded and marketable program that will create for the visitor an easy to understand and easy to access parking program. This will be accomplished through the use of program branding and marketing, an integrated signage plan, validation programs, a web-based information clearing house and special event parking programs.

Another important role that the parking management organization will play is that of “community educator” on parking.

Parking management strategies and programs will be cross-marketed to promote downtown as a unique and visitor-friendly regional destination. The parking management organization will develop an effective branding and marketing program. Parking availability shall be well publicized to enhance the perception of parking as a positive element of the downtown experience. Reinvestment of parking resources back into the downtown will be encouraged and promoted.

In addition to web-based information, the parking management organization will develop a variety of educational materials and workshops to promote parking management programs. The parking management organization will work closely with the TBID, community economic development and other downtown agencies/stakeholders to promote, educate and market parking programs in downtown Mammoth Lakes.

Guiding Principle # 7

PROGRAM DEVELOPMENT/RESPONSIVENESS

- **Responsiveness to the Needs of a Diverse Customer/Citizen Base**

The parking management organization should aim high and strive to achieve a “best-in-class” parking program. All aspects of the Mammoth Lakes parking program should reflect an understanding of what the customer desires in terms of a positive and memorable experience.

Special programs to address retail enhancement initiatives, shared-use parking, employee parking, special/large events parking, etc. will be developed. These programs will be developed in a collaborative manner and designed to support larger community goals and objectives.

A range of program options should be developed to address the unique needs of different seasons as well as special programs for permanent residents as contrasted to tourism based parking programs.

Guiding Principle # 8

INFORMATION CLEARINGHOUSE/ COORDINATED PROGRAMS

- **Parking Information Clearinghouse & Coordination of On-Street, Off-Street, and Special Event Programs**

The Parking Management Organization shall take a lead role in parking program coordination. From a planning and information clearinghouse perspective, the parking organization will be a unifying and centralized resource that will coordinate and distribute information related to parking supply, availability, planning, and special programs, event activities and other resources such as the TBID.

This will be done through physical signage, branding and marketing, a robust planning function and a strong web-based information program.

Guiding Principle # 9

PLANNING / URBAN DESIGN

- **The Parking Management Organization shall have an active and comprehensive planning function.**

The Parking Management Organization will be included in all City and regional strategic and transportation planning efforts.

The Parking Management Organization will work with City staff to review and evaluate parking zoning requirements, the development of parking design standards that promote good urban design principles related to parking structures and mixed-use projects, and the creation of parking standards for transit oriented development.

Effective parking planning will mean an improved understanding of parking supply/demand, and the development of parking infrastructure that will enhance and better support the community strategic goals and urban design objectives.

Guiding Principle # 10

SAFE, ATTRACTIVE & WELL-MAINTAINED FACILITIES

- **Clean, Safe, Attractive and Well-Maintained Facilities**

Emphasis will be placed on enhancing parking facility appearance, maintenance, safety and security, regardless of facility ownership. The Parking Management Organization will promote standards to encourage comprehensive and pro-active facility maintenance and security plans. Facility maintenance reserves and other maintenance best practices will be encouraged in Town owned facilities. Publicly available parking facilities marketed through the Parking Management Organization will agree to a community developed set of parking facility standards. Participating facilities will be routinely monitored.

Some parking facilities incorporate public art and creative level identification and theming to enhance the parking experience for their patrons and make large parking facilities more navigable. Continued development of these initiatives will be supported.

Guiding Principle # 11

EFFECTIVE PARKING MANAGEMENT/ACCOUNTABILITY

- **The Parking Management Organization will be a forward thinking, “best in class” parking program.**

The Parking Management Organization should anticipate future patron needs in the context of the Main Street plan and other planning initiatives and seek to integrate supportive parking and multi-modal access strategies as appropriate.

Evaluation of other parking management best practices and new technologies should occur on an on-going basis.

Effective facility maintenance, infrastructure reinvestment and other system management fundamentals will be routinely addressed.

Guiding Principle # 12

SELF-FUNDING/ACCOUNTABILITY

- **The parking system will work toward a goal of being financially self-supporting and accountable to stakeholders.**

Parking management will work toward developing a parking system that is self-supporting and sets aside funds for maintenance reserves and future capital asset funding.

By aligning approved parking revenue streams from on-street, off-street, enforcement, (and potentially special assessment fees and fee-in-lieu programs), it is possible to develop a parking system that self-funds all operating and maintenance expenses, facility maintenance reserves, planning studies and future capital program allocations.

A consolidated parking revenue and expense statement should be developed to document all parking related income streams and expenditures to give a true accounting of parking finances.

Parking management strategies and programs should provide an integrated, action-oriented and accountable system that supports, facilitates and contributes to creating an ideal downtown.

Guiding Principles Summary:

These Guiding Principles will serve as a foundation for near and longterm decision-making and implementation of parking management strategies in the Town of Mammoth Lakes.

These strategies are intended to support the on-going economic development and vitality of Mammoth Lakes. **This is a process not a one-time task.**

By building community consensus in support of these principles, they should provide a solid foundation from which to begin implementation of an effective program of parking and access management strategies designed to support the larger strategic and economic development goals of Mammoth Lakes.

It will be important for the Town of Mammoth Lakes to codify the Guiding Principles for Parking Management as part of the City or agency code to assure their on-going role in facilitating decision-making for the parking systems over time.

Teamwork and collaboration between the Parking Management Organization, Town officials, downtown organizations, transportation agencies and other stakeholders will be a key for success moving forward.

The Parking Management Organization will support the Main Street plan, other Town's General Plan, and the programs and projects of the Town's Department of Community and Economic Development.

Parking District Models

The following is an overview of effective parking system organizational models for review as the Town of Mammoth Lakes considers a range of parking program options. This document provides an overview of key issues, program organizational options, examples of other city programs and potential benefits and drawbacks of the various options.

Effective Parking System Organizational Models

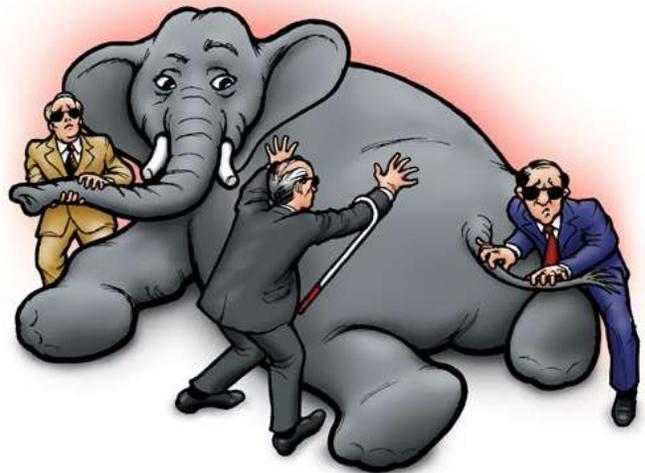
There are several very effective parking system organizational models, each with its own strengths and weaknesses depending on several factors such as the parking system's size, programs offered, political landscape, etc. The four primary successful organizational models are:

- A Consolidated (“vertically integrated”) City Department model
- The Parking Authority model
- The “Contract” or Downtown Association model
- The Parking District model

There are of course several variations and hybrids of these models, but these are the four primary alternatives. All have one common factor that contributes to their success: They address the major problem associated with horizontal fragmentation of a parking system.

You may remember the old story about a group of blindfolded men being led into a room that contained an elephant. Each man was directed to a different part of the elephant and asked to describe it. One said it seemed most like a tree trunk. Another said it seemed more like a snake. Another said it was more like a fire hose. You get the idea.

In a parking program where each department only manages one aspect of the parking system, such as on-street parking, enforcement or parking structures – often times no one has responsibility or the perspective to manage all these interrelated components as a system. In short, no one entity sees the whole set of issues or takes advantage of potential solutions that might be available if all the variables were fully understood and managed as a system. In one study where different departments each had a small amount of parking to manage (for example a couple decks and surface lots) along with responsibilities for several other areas, the observation was made that “parking was everyone’s part-time job, but no one’s full-time job.” This is a common problem we are hopeful the Town of Mammoth Lakes can side-step with the right organizational framework.



Parking Organizational Options Evaluation Criteria

When Kimley-Horn evaluates which organizational option might work best in a given community, we often use the following technique with various stakeholder groups. First we explain how each model typically works and describe in detail its defining characteristics. We then ask the stakeholders to envision each model as it might develop in their community. Then we have them rank each organizational option by the following criteria – Which organizational option:

- Best supports economic development
- Is most efficient/cost effective
- Is most customer-friendly
- Is most politically feasible
- Is most focused on the vision
- Is easiest to achieve
- Is most responsive to businesses and stakeholders
- Is most financially viable
- Provides the most effective coordination

The process is very effective in helping communities evaluate the organizational options and begin the process of revolutionizing and reinventing their parking system. An effectively organized parking program can be a significant contributor and partner in helping communities achieve their larger strategic goals and objectives. One entity needs to take ownership of parking issues and be the central point for all coordination, complaints and services.

The following is a brief description of parking system organizational models that have shown demonstrated success in recent years. Each description is illustrated by an example of a specific program based on that model.

Consolidated (“Vertically Integrated”) City/District Department Model

A Consolidated “Vertically Integrated” City/District Department Model is essentially a typical department – lead by a department head and consisting of a varying assortment of support staff. The defining characteristic of this model is that the department director has complete responsibility for the management of all parking related program elements. The primary elements of these being:

- Off-street parking facilities
- On-street parking resources
- Overall program financial performance
- Parking system planning
- Parking enforcement

There are numerous other related areas that can also be included:

- Transportation demand management (Trip Reduction Programs, Preferential Parking for Car/Van Pools, transit programs, etc.)
- Parking system branding, marketing, and community outreach.
- Implementation of new technologies.
- Parking system planning (e.g., zoning, financial planning).
- Residential permit parking programs.
- Interface with downtown development and economic development

The City of Fort Collins, Colorado has a consolidated parking management program that incorporates off-street parking (parking structures and surface lots), on-street parking (time limited on-street spaces), and parking enforcement. The city's Parking Manager also has developed a program to promote effective coordination and collaboration with the owners of private parking to better support evening restaurant parking demands and for special events. Another feature arising from this integrated approach is that the city is currently embarking on a parking technology assessment. A key feature of this assessment is to identify technology options that could link on-street/enforcement systems (Auto-Vu LPR enforcement technology/T-2 systems software) with the next generation of off-street parking equipment and potentially new on-street multi-space meters.) This type of creative and integrated thinking is more common in systems with a vertically integrated organizational structure.



The Parking Authority Model

Parking authorities typically operate with a small staff and engage a private parking operator to manage day-to-day operations. One advantage of the Parking Authority model, especially in a municipal setting, is that it puts all the major parties at the same table. This helps stakeholders gain a deeper appreciation for the competing agendas between various constituents.

The defining characteristics of a Parking Authority Model include:

- It has a defined mission and vision
- It is governed by a detailed management agreement
- It often has bonding capability
- Most often has responsibility for all aspects of parking operations (off-street, on-street, and enforcement)
- It is typically headed by a President or Executive Director
 - Because of this they tend to attract the highest caliber parking management personnel
 - The President or Executive Director reports to a board (Typically 7 – 15 members)
 - The board is comprised of influential and invested downtown stakeholders.
 - Board composition typically includes:
 - High level city staff.

- Mayor or City Manager (or appointee).
- Director of Finance.
- Director of Public Works.
- Property owners/developers.
- Downtown association members.
- Chamber of Commerce representative.
- Large downtown employers.

Although the authority may not control all of the parking in a downtown area, that does not mean they cannot affect the entire downtown. In Toledo, Ohio, the Downtown Toledo Parking Authority (DTPA) so dramatically transformed the operations in its three facilities that all the other private parking operations were forced to follow suit. Now virtually all downtown parking facilities have attendants in new uniforms, customer service training for front-line staff, parking structure interiors are painted white, new customer friendly parking technologies and programs are being installed/instituted – all following the DTPA’s lead.



The “Contract” or Business District Model

In a surprising number of communities across the United States, downtown business improvement districts or downtown associations are taking operational responsibility for parking. Similar to the Parking Authority Model, the Contract or Business District Model is governed by a well-defined operating agreement that sets specific expectations and limits on the use of parking assets. These contracts or agreements must typically be reauthorized every 3 – 5 years based on whether the defined contract goals were met. If reauthorized, it is not uncommon for new goals and program objectives to be set for the next contract period.



In Boise, Idaho the off-street parking program is professionally managed by the Capital City Development Corporation – the city’s urban renewal agency. Through the aggressive use of tax increment financing combined with a strategy of leading other desired development with parking infrastructure investment, downtown Boise has become a national model of downtown resurgence.

Another example of this model can be found in Tempe, Arizona. The City of Tempe does not own

any significant parking facilities, only a few small surface parking lots. In Tempe, the need for a coordinated parking system solution to provide a more user friendly experience for visitors drove the downtown organization – the Downtown Tempe Community, Inc. (DTC) – to create what amounts to a parking management overlay program. Working with the owners of the off-street parking assets, they created a parking system management plan. Through creative signage, a common parking validation program, and extensive marketing, they branded the parking system to such an extent that it appears that Tempe has a well-managed and comprehensive parking program, although they do not own all of the individual assets. DTC acts, in essence, as a private parking management firm. They manage all parking staff and programs themselves, and return all profits to the facility owners (keeping a modest management fee). The DTC also manages the city’s on-street parking resources and reinvests on-street parking revenues back into the downtown.

The Parking District Model

The Parking District Model is slightly different than the previously defined model, but as mentioned earlier, the one common element of all of these successful models is the goal of a creating a “comprehensive parking management function” under the control of one leader (“vertical integration”).

The characteristics of a parking district include:

- They typically have a defined area with set boundaries.
- They may have a special assessment that applies to all properties within the district.
 - This revenue generally goes toward defined district improvements, but could be restricted to parking or transportation related projects.
- They are generally run by an Executive Director or President (although some are run by city department heads).
- All revenues are collected and managed by the district for reinvestment in the district.
 - In some cases, if revenues exceed operational or capital program needs, the additional funds are returned to the city’s general fund.
 - In other cases, the city assesses the district a fee based on a percentage of net revenues in-lieu of not assessing property taxes on the parking facilities. This money goes to the city’s general fund.
- Revenue sources typically include:
 - Special assessment revenue (if applicable).
 - Off-street parking revenue.
 - Could include miscellaneous revenue sources such as: advertising (in parking structures), vending machines or retail space rental (mixed-use parking facilities).
 - Could also include special event parking revenue.
 - On-street parking revenue.



- Parking enforcement revenue.

Parking Districts have made some significant contributions to the communities they serve. For example, in Boulder, Colorado, the Downtown and University Hill Management District/Parking Services can boast the following list of accomplishments (all paid for with parking district revenues):

- Funding of the Eco-Pass Program – in excess of \$800,000 annually.
 - This program gives all downtown employees a free bus pass and contributes to a 62% modal split among downtown employees (reducing parking demand).
- Repayment of a \$3.4 million Pearl Street Mall Improvement Bond - \$500,000/yr.
 - This is a good example of the parking program contributing to community economic development.
- Payment of Parking Structure Debt Service Obligations.
 - Parking district revenues fund the development costs of downtown public parking structures as well as all parking operating and maintenance costs.
 - One of the more impressive parts of this program has been the leadership in defining appropriate design guidelines for parking structures.
 - Only mixed-used structures are permitted.
 - They must incorporate street level retail and be architecturally consistent with the downtown fabric. Some have been multi-modal in nature – integrating transit functions with parking.



The Professional Services Model

A more recently developed organizational model is the “Professional Services” model. In this model, a smaller more professional level parking services group is developed in conjunction with the outsourcing of day-to-day operations. While there are many potential variations under this category, the most successful variation involves a group that is primarily administrative in nature.

The management group is responsible for program elements such as: creating the vision and mission of the program, community outreach and program development (including assessment of new technologies, etc.), parking system planning, interface with economic development programs, interface with transportation system functions (including alternative transportation programs), contract administration, parking facility long-term maintenance program

development, system financial administration/audit functions, and special projects management.

Parking operations are outsourced to a qualified parking management firm. Their responsibilities would typically include: off-street parking facility operations (cashiering services, pay-on-foot operations, etc.), daily facilities maintenance, security, etc. Some communities have extended these contract services to include the operation of on-street parking and parking enforcement programs including citation collections and management. For on-street and enforcement operations meter maintenance and collections, citation issuance, collections and adjudication can all be outsourced as well.



Another feature often used in conjunction with the Professional Services Model is the development of “on-call services agreements” for various types of consulting and professional services such as: engineering facility condition appraisals, technology assessments, revenue control system assessment and audits, etc.

The primary advantages of this model are that parking is managed by a lean group of management staff focused on key areas such as:

- Program Administration and Finance
- Audit/Revenue Control
- Contract Administration
- Special Projects
- Marketing/Branding/Communications
- Economic Development/Customer Satisfaction/Business Community Interface

Day-to-day operations are outsourced. This can have the effect of keeping a better focus on the strategic goals of the parking program without getting mired in the myriad operational issues that make up day-to-day management.

Communities beginning to implement this approach include the City of Beverly Hills and the City of Lincoln, NE.

The Parking Management Collaborative Approach

Another new approach was developed specifically to address the set of conditions that exist in communities that have chosen not to develop a significant off-street public parking system and therefore do not have much ability to influence the off-street parking market in traditional ways.

The Parking Management Collaborative approach is comprised of the following basic tenets:

- There is a demonstrated need to improve the ease of use and access to parking in the downtown, especially for occasional visitors.

- There is recognition that a comprehensive approach that will coordinate and integrate both on-street parking and off-street parking assets is needed to make the downtown more visitor-friendly.
- On-street parking assets will be better managed as a short-term parking resource with the primary management goal being to promote a high degree of turnover for the benefit the merchants and businesses that depend on an effectively managed supply of convenient short-term parking resources. A goal of maintaining an average on-street occupancy level of approximately 85% shall be key program goal/benchmark.
- Because the majority of off-street parking in the downtown is privately owned and operated, a collaborative approach to developing a downtown parking management strategy is needed. The primary objective of this approach is to develop what is essentially a “parking management program overlay” that will create a well-coordinated and marketed user-friendly parking system that will appear to the casual user as a public parking program.
 - The key functional elements of this parking management overlay include:
 - Program Branding and Marketing
 - A comprehensive updated downtown parking and wayfinding program
 - A central parking and transportation information clearinghouse function
 - A special event coordination function
 - A significant parking and transportation planning function
 - Coordination with community and economic development activities
 - Management of City owned parking assets
 - Coordination with the downtown management organization in support of downtown business needs
- The Parking Management Collaborative will strive to promote superior, customer oriented parking programs and parking facility standards.
- Parking planning and coordination will be important functions related to understanding and responding to both the current and future parking needs of uptown users.
- The diverse needs of various user groups will be considered, including visitors, employees, employers, property owners and parking management firms, through active planning, coordination and communications.
- The Parking Management Collaborative shall be considered an integral component of the community’s economic development strategies and programs.

The following nine elements are typical of the primary strategies to be implemented by the Parking Management Collaborative:

1. Develop a parking system brand and marketing program.
2. Create a web-based parking and transportation information clearinghouse. Become the central point for coordination of information related to parking and access options for the community.
3. Promote the principles of balanced access for all travel modes, including vehicular, pedestrian, bicycle and transit, to meet community-wide goals
4. Focus on creating an excellent customer service orientation for all parking user groups - visitors, employees, employers, property owners, etc.
5. Develop an effective interface between public and private parking providers.

6. Work with parking management collaborative members to create high standards for safe, attractive and well-maintained facilities
7. Take an aggressive and proactive approach to community education related to parking and transportation issues and new program development. Be responsiveness to the needs of the diverse customer/citizen base.
8. Actively coordinate with economic vitality initiatives, retail support strategies and other community and economic development programs.
9. Develop a strong parking and transportation planning function and promote good urban design, shared parking, walkability and transit oriented development approaches to create a superior, people oriented urban center.

This approach needs only a small, but highly effective staff to be successful. The recruitment of an executive caliber program director with strong vision and excellent communication skills is essential for this strategy to succeed. The other key ingredient is to get buy-in from the major parking property owners. This is typically accomplished by recruiting them to be on the program's Board of Directors. In some cases where all the right individuals are already on the board of an existing downtown organization (especially if creating "yet another board" would be seen as an issue) this function could become an initiative of that organization.



One of the key values of have the major parking property owners engaged at this level is that this will lead to them directing the parking management firms they manage or hire to "get on-board" with this program. Engaging the parking management firms on another level can also be very valuable because of their detailed knowledge of conditions "on the street" and their knowledge parking management principles in general.

The first major city to employ this model is Charlotte, NC, where the collaborative was located, organizationally, in the business improvement district known as the Charlotte City Center Partners

The Eco-District Model

EcoDistrict Initiatives are a comprehensive strategy to accelerate sustainable neighborhood development. The purpose of this overview is to clarify the value proposition, define performance areas, and outline an implementation strategy as it relates to adapting this approach to a parking and transportation program organizational framework.

At its heart an EcoDistrict is a neighborhood or district with a broad commitment to accelerate neighborhood-scale sustainability. EcoDistricts commit to achieving ambitious

sustainability performance goals, guiding district investments and community action, and tracking the results over time.

A parking and transportation Eco District approach would recognize technologies and strategies for enhancing district sustainability, such as energy and water management systems within parking developments, support for green streets, the promotion of resource conservation, etc.

Since parking can, over time, be a significant revenue source, this approach envisions parking revenues being dedicated first to supporting parking program operations, maintenance reserves, and technology upgrades, but once the parking program is well established and generating excess revenues that these resources would be invested in a variety of sustainability initiatives. Examples might include programs such as:

- Community bike programs – to support an overall “Parking Once Strategy”
- Car sharing programs – to support downtown residential development
- Pervious pavement installation and bio-swales as demonstration projects in city surface parking lots

It should be noted that the widespread deployment of these strategies has been slow to develop due to lack of comprehensive assessment tools, scalable project capital, and public policy support. The EcoDistricts Initiative focuses on removing these implementation barriers and creating an enabling strategy to accelerate neighborhood-scale sustainability. This parking program reorganization could be an opportunity to introduce this approach in an innovative way.

The EcoDistricts Initiative is distinct from most green development strategies that focus on brownfield or greenfield development that are primarily led by master developers or public agencies. Instead, the parking and transportation EcoDistricts Initiative targets districts - at the intersection of buildings, infrastructure and people. This initiative would be “working upstream” of rating systems like LEED-ND to develop tools and strategies for engagement and project implementation.

Generally, the EcoDistricts approach brings together community stakeholders, property developers, utilities, and the town government to solidify a shared sense of purpose and partnership through the following actions:

- Create an engagement and governance strategy to build community support, set priorities and act
- Develop an assessment and management toolkit to guide project development and track ongoing performance
- Implement sustainability projects through technical and economic feasibility analysis, assembly of project financing, and establishment of public-private partnerships
- Identify commercialization opportunities for companies to test promising products and practices
- Establish municipal policy and regulatory structures to support EcoDistrict development

In this specific application, the general goals above still apply, however because of our focus on parking and transportation functions there will be some variation and more specific applications. However, the broad-based nature of parking and transportation, the need for on-going stakeholder engagement and the larger economic development focus makes this application very appealing. Overall, transportation accounts for about 30% of the nation's carbon footprint. Organizing your parking program to have an explicit "eco-district" orientation would send a strong signal of the Town's commitment to environmental progress.

Characteristics of Effective Parking Management Programs

The following essay was originally developed to be a chapter in the book entitled: *Making Business Districts Work* published by the International Downtown Association. It provides a comprehensive overview of the program characteristics common to highly effective municipal or business district parking programs.

Kimley-Horn has worked extensively with business districts around the country. Based on evaluating numerous parking systems of various sizes and complexity, Kimley-Horn has identified a set of twenty characteristics, that when combined into an integrated programmatic approach can provide the basis for a sound and well managed parking system. The twenty characteristics include:

1. Clear Vision and Mission
2. Parking Philosophy
3. Strong Planning
4. Community Involvement
5. Organization
6. Staff Development
7. Safety, Security and Risk Management
8. Effective Communications
9. Consolidated Parking Programs
10. Strong Financial Planning
11. Creative, Flexible and Accountable Parking Management
12. Operational Efficiency
13. Comprehensive Facilities Maintenance Programs
14. Effective Use of Technology
15. Parking System Marketing and Promotion
16. Positive Customer Service Programs
17. Special Events Parking Programs
18. Effective Enforcement
19. Parking and Transportation Demand Management
20. Awareness of Competitive Environment

A parking system that has all twenty of these characteristics is well on its way to being in a class apart from the majority of parking systems. The ultimate goals are a system that provides professional management, understands the role it plays in contributing to the larger objectives of the downtown or shopping district and is responsive to the community to which it serves.

Characteristic #1 – Clear Vision and Mission

Truly effective parking systems have a clear vision and well-defined mission for the parking system. The development or periodic reassessment of the parking system vision/mission statements should be undertaken as an open and inclusive process involving a wide range of

downtown stakeholders. Typically, it is recommended that the following groups be included in the public input process:

- City Officials (including elected officials, planning staff, transit agencies, etc.)
- Downtown Development Agencies
- Downtown/District Business Associations
- Downtown/District Property Owners
- Downtown/District Merchants
- Downtown/District Employees
- Downtown/District Customers

The development of a parking system's vision and mission statements should have one overriding goal; to see that the parking system's purpose and direction are tied to and supportive of the larger district's strategic development plan. There are a variety of ways that parking can support the health, vitality and sustainability of a downtown or business district. Having a professionally managed parking program that presents clean, safe, attractive and well-maintained facilities is perhaps the most visible dimension. Other attributes include providing an adequate supply of parking overall and the appropriate allocation and management of those resources to best support the various businesses that depend on these resources for their success. Successfully meeting these goals promotes downtown business retention and attraction.

The parking system administrator should play a key role in providing educational support to community leaders about the importance of parking and the role(s) parking can play (and cannot play) in meeting community objectives. Staying abreast of the latest technological developments related to parking systems can broaden the options available to improve parking system management effectiveness and efficiency. Common problems for downtowns, such as promoting turnover of short-term on-street spaces without being perceived as "unfriendly or heavy-handed," or providing more convenient customer payment options are good examples. The use of new technology to support the mission and vision can have a profound impact on the perception of the parking system and how it contributes to achieving the goals of the downtown it serves.

In effective systems, Parking's financial responsibilities are well defined and understood. This is a critical component of the vision/mission, as it directly impacts the perception of whether the parking system is meeting its financial obligations and expectations. Part of this important discussion relates to whether the parking system is expected to be subsidized by the City's General Fund, or other revenue sources such as Tax Increment Financing, contributions from Business Improvement Districts, Special Assessment Districts, etc. or whether parking is expected to cover its own operating and maintenance costs, but not debt service. Or, is parking expected to cover all costs and generate additional revenue. Which of these options is feasible for your community depends on a number of variables.

Characteristic #2 – Parking Philosophy

A succinct statement or statements reflecting your philosophical approach to parking can provide valuable tools for communicating to your patrons, stakeholders and staff. Some examples of "parking philosophy" are noted below along with a brief commentary.

1. Parking Isn't About Cars . . . It's About People

This statement reflects an understanding that parking is not simply the act of temporarily storing cars, but it is in fact more about addressing “people” needs at the transition from the vehicular to the pedestrian experience. Under this philosophy, issues such as facility cleanliness, safety, lighting, wayfinding and customer service move to the forefront. Functional design elements that directly impact user comfort such as stall widths, turn radii, walking distances, etc. also take on special importance.

2. People Don't Come Downtown To Park

This concept reinforces the reality that parking, while an important support function and critical infrastructure element, is not the reason people visit your downtown. For the downtown to be successful there must be good restaurants, interesting retail and other special attractions. Even the best run parking system with well-designed facilities will not “attract” people to come downtown, however, poorly run operations or dysfunctional facilities can definitely be excuses for people NOT to come downtown. The fundamental principle behind this philosophy is three-fold: 1.) The role of parking is to support other downtown activities. 2.) Eliminate parking as a “reason not to come downtown” and 3.) Recognize what parking is not, i.e., an attraction.

3. Parking Should Be A Positive Experience

For years a parking consulting firm had a slogan: “Parking should be a non-event.” This notion has undergone a qualitative evolution to make parking not just a “non-event,” but actually a “positive experience.” In their book “The Experience Economy,” Joseph Pine and James Gilmore address the concept that, especially in America, what customers are actually purchasing are “positive experiences.” One expression of this transition can be seen in the healthcare arena. Have you noticed that the lobbies of newer health care facilities have taken on the feel of grand hotel lobbies? At the hospital where I used to work, we extended the look and feel of the new bed tower lobby (marble, glass, air conditioning, etc.) into the parking structure elevator lobbies to extend that welcoming experience out into the parking environment. Similarly, the more extensive customer service training provided for hospital reception desk staff was also required for parking attendant and valet parking staff.

4. Parking Is The First And Last Experience

Building on the concept above is an appreciation of the fact that most of our customer's first and last impressions of any venue really begins and ends with their parking experience. You might enjoy the best meal followed by a fabulous evening of entertainment, while downtown, but if you have to circle and circle to find a parking space or are accosted walking from your car to your destination, this will taint your whole experience. Follow this up by an encounter with a surly, gum-chewing attendant upon exiting the parking facility and guess what you will be talking about the next day (It probably won't be the delicious meal you had at Gino's.)

5. Parking Should Be Friendly, Not Free.

There is no such thing as “free parking.” One of the ongoing challenges that downtown’s face when it comes to parking is cost. Because of land values, densities and walking distance issues, parking structures are here to stay in the downtown environment and with them is the need to charge for parking in one form or fashion. The perception that parking at the mall is “free” doesn’t help (even though it is not true). Even if you promote “free parking” as a marketing concept, someone is paying for that parking. Either through increased taxes or an increased cost of goods or services, the cost of providing parking is still there. This philosophy recognizes this reality and focuses instead on providing a friendly, well managed parking experience.

6. Parking Is A Component Of The Larger Transportation System.

It is surprising how often parking gets divorced in people’s minds from being a component of the larger transportation system. Structured parking, because of its cost, is often the reason that development projects “don’t pencil” to use developer lingo. By considering parking in the larger context of a broad range of transit and transportation alternatives, demand management strategies (including shared parking policies) can be developed that help reduce the amount of parking required, especially in urban areas where good bus transit, light rail, taxi service and increasingly in-town residential developments can be found. Developing programs that integrate complementary parking and transportation strategies is a hallmark of this philosophy.

Characteristic #3 – Strong Planning

One consistent characteristic of well-managed and forward thinking parking programs is strong planning. The first step in developing a well-managed parking planning function is to have a solid understanding of existing parking resources. Documenting the basics is fundamental. Below are some basic planning tenants that should be considered:

- Parking inventory is complete and up-to-date (includes both public and private parking).
- Parking inventories are sub-divided by type and use of space.
- Parking utilization, by type of spaces is known and trends tracked.
- Changes in supply are documented.
- Changes in utilization are tracked and understood.
- Periodic Parking Supply-Demand Studies are completed.
- Quality parking maps are available and up-to-date.

One of the key planning tools that parking departments often overlook or don’t understand is land-use data. Successful parking systems develop relationships with city or regional planning agencies so that valuable land-use data, information on proposed developments, downtown planning maps, etc. can be obtained and used in crafting parking planning strategies. When reviewing a strategic parking plan I look for the following items:

- Is land use data readily available and up-to-date?

- Is historical parking development well documented?
- Is planning for the next parking development “on-the-drawing board”?
- Is Parking represented and participating in other types of community studies e.g., downtown strategic plans, marketing studies, retail studies, economic development studies, transportation studies, traffic studies, etc.?
- Have strategically located potential parking development sites been identified?
- Are future parking development sites “land banked”?
- Are potential sites assembled to achieve an adequate footprint size to develop efficient parking structures (300-325 sq. ft. per stall)?
- Have parking lot and structure design guidelines been developed?

Characteristic #4 – Community Involvement

One common problem I often find with struggling parking programs is that they are operated only to satisfy a narrowly defined set of internal objectives (typically focused on revenue generation). Successful parking programs understand that their larger purpose is to support the downtown and the businesses that create and sustain downtown vitality. Parking systems should develop close and cooperative working relationships with other community groups such as economic development agencies and downtown business associations.

This does not mean that the parking system exists simply as a tool to be manipulated by these organizations. The parking operation has its own goals and objectives. For example, if the parking system is operating under a mandate to be self-supporting, it may not be able to subsidize a downtown validation program, even though the local downtown business associations might desire this. However, acting as partners, a mutually beneficial solution can be devised to meet the overall objectives of both organizations whereby costs are shared or alternative funding sources are obtained.

Another significant area of potential partnership is downtown and parking system marketing. In the many successful downtowns, Parking co-sponsors or shares in downtown marketing and promotional initiatives. The Downtown Business Association, the Chamber of Commerce and other groups promoting the downtown should include parking information in their publications and parking publications should promote the current programs of the other agencies. This cooperative relationship creates an impression of a well-managed downtown and positively advances the image of the downtown.

Successful parking operations actively solicit public input from a variety of sources including: promotion of public forums, use of parking task force groups, development of a group of “parking advisors” – people who have demonstrated an interest in parking issues (sometimes characterized as “complainers”) and who are recruited to provide input on an occasional basis. The key to success is to listen to the concerns of your customers, act promptly to resolve the issues (or engage and educate them on the “real issues”) and then follow-up to make sure their issue has been satisfactorily resolved. By doing this, you short-circuit that stream of negativity, which too often circulates among downtown customer groups, and you can begin to build a network of parking system supporters.

Characteristic #5 – Organization

Whether a City department, a quasi-independent parking authority, an arm of an urban renewal agency or the responsibility of a Downtown Business Association, an important question is whether the parking organization is structured and staffed to best achieve its stated goals?

Some basic questions to ask related to the issue of organizational structure include:

- Are all parking operations to be managed through a centralized operation or can other departments or agencies get involved in limited parking operations?
- Is parking to be managed in-house?
- Should certain functions be out-sourced?
- Are there advantages to a hybrid approach?
- Does the current organization / staffing plan provide the right mix of skills, talents, and abilities?
- Is staffing as efficient as possible? Are there tools in place to evaluate staffing adequacy? Efficiency? Program effectiveness?

Another component of the evaluation process is to identify the program elements for which the parking system will be responsible. Table 1 below provides a list of potential program elements.

Possible Scope of Operations	
Overall Leadership and Management	ADA Compliance
Program Definition and Development	Parking Facility Maintenance Programs
Parking System Revenue Control and Accounting	Develop Consolidated Financial Reporting System
Manage Parking Facilities	Special Events Parking Management
Contract Management	Parking Resource Allocation
Marketing/Promotion/Information	Rate Setting
Parking Planning and Coordination	Residential Parking Permit Programs
Parking Facility Development and Construction	Special Program Development
Community Outreach & Education	Service and Information Center (Parking Hotline)
Equipment and Technology Specifications	Wayfinding and Signage
Equipment and Technology Maintenance	Customer Service Programs
Parking Enforcement	Validation Programs
On-Street Parking Management	Valet Parking Programs
Meter Collections and Maintenance	Parking and Transportation Demand Management
Employee Parking	Facility Safety / Security / Risk Management

Table 1 – Possible Scope of Operations

Characteristic # 6 – Staff Development

Another interesting thing about parking is that, unlike property management, public administration, etc., there are no formal educational programs for parking management. You cannot go out and hire someone from the latest crop of college parking graduates. However, this is beginning to change. The International Parking Institute (IPI) has a highly regarded and reputable educational/certification program called the Certified Public Parking Administrator (CAPP) program that is administered by the University of Virginia. The National Parking Association offers the Certified Parking Facility Manager (CPFM) certification program. For the most part, parking professionals still are learning as they go and bringing with them numerous skills and perspectives imported from a variety of previous work experiences.

One characteristic of the most successful parking programs is recognition of the unique knowledge, complexity, and broad skill sets required to be successful in parking. These programs invest in the parking specific training and educational opportunities to develop their staff into parking professionals. The following is a list of options to consider to actively promote parking staff development within your parking operation:

- Support participation in the International Parking Institute and National Parking Association’s certification programs.
- Support participation in local, state, regional and national parking associations to create networking and peer-to-peer communications. These associations also provide the best access to parking specific training opportunities for various staff levels from front-line to administrative.
- A recommended best practice is to have an “Operational Peer Review” performed on your operation. An “Operational Peer Review” involves having a representative from a similar municipal program visit and critique your downtown parking program with a “fresh set of eyes.” Typically this service is reciprocated. This is generally a low cost initiative that can be set up directly or through the national, regional or local parking association and is an effective way to gain and share parking knowledge.
- Build a parking resource library – The following is a basic bibliography of good parking texts that can increase your staff’s knowledge of the parking industry:
 - i. Parking 101, A Parking Primer – International Parking Institute Fredericksburg, VA, 2002
 - ii. Parking - Robert A. Weant and Herbert S. Levinson, Copyright - Eno Foundation for Transportation, Washington, DC, 1990
 - iii. Parking Structures, Planning Design, Construction, Maintenance and Repair – Anthony Chrest, Mary S. Smith, Sam Bhuyan, Kluwer Academic Publishers, Third Edition, Boston, MA, 2001
 - iv. The Dimensions of Parking - Various Authors, Copyright – The Urban Land Institute and National Parking Association, Fourth Edition, Washington, DC, 2000
 - v. Parking Generation – Institute of Transportation Engineers, ITE Publ. No. IR-034A, 2nd Edition, Washington, DC, 1987
 - vi. Shared Parking – Study coordinated by the ULI in association with Barton-Aschman Assoc., Inc, Copyright – The Urban Land Institute, Washington, DC, 1983 (Currently being updated)
 - vii. Lighting for Parking Facilities – Illuminating Engineering Society of North America (IESNA) Publ. No. RP-20-98, 2nd Edition, New York, NY, 1998

Note: A more comprehensive “Recommended Reading List for Parking Professionals” is provided in Appendix I.

Characteristic #7 – Safety, Security and Risk Management

The importance of providing a safe environment in your parking facilities cannot be overestimated. The actual and perceived security within your facilities impacts the success, not only of the parking operation, but also the businesses supported by those facilities. Planning for security in your parking facilities should begin during the design of new facilities. If you are inheriting existing facilities, a security audit of all facilities is highly recommended. The concept of “Crime Prevention Through Environmental Design” (CPTED) provides useful tenets for architects, facility planners, designers, and law enforcement/security and parking professionals. Utilizing CPTED concepts helps create a climate of safety in a parking facility, on a campus or throughout a downtown, by designing a physical environment that positively

influences human behavior. These concepts can also be used to retrofit environments to address specific security issues as they develop or to address emerging concerns as conditions change.

CPTED builds on four key strategies: territoriality, natural surveillance, activity support, and access control.

- **Territoriality:** People protect territory that they feel is their own and have a certain respect for the territory of others. Fences, pavement treatments, art, signs, good maintenance, and landscaping are some physical ways to express ownership. Identifying intruders is much easier in a well-defined space.
- **Natural Surveillance:** Criminals don't want to be seen. Placing physical features, activities, and people in ways that maximize the ability to see what's going on discourages crime. Barriers, such as low ceilings, solid walls, or shadows, make it difficult to observe activity. Landscaping and lighting can be planned to promote natural surveillance from inside a building and from the outside by neighbors or people passing by. Maximizing the natural surveillance capability of such "gatekeepers" as parking lot attendants, maintenance personnel, etc. is also important.
- **Activity support:** Encouraging legitimate activity in public spaces helps discourage crime.
- **Access control:** Properly located entrances, exits, fencing, landscaping, and lighting can direct both foot and automobile traffic in ways that discourage crime.

These principles can be blended in the planning or remodeling of parking facilities and other public areas. In parking environments, the following specific strategies are recommended:

- Incorporate the following features into the design of new parking facilities:
 - Higher floor-to-floor heights to improve openness.
 - Glass backed elevators and glass enclosed or open elevator lobbies.
 - Glass enclosed stairwells, perhaps open to the interior.
 - "Blue Light" security phones.
 - Security screening on the ground level.
 - Limit access at the parking facility perimeter to locations where patrons pass by the office or cashier booths.
 - Eliminate potential hiding places (for example under stairs, within storage areas, etc.)
 - Maintain low level landscaping.
- Insure that all your facilities are well lighted and meet or exceed the recommended minimums for parking facility lighting as established by the Illuminating Engineering Society of North America (IESNA). Develop facility lighting standards. Provide consistent lighting levels in all facilities.
- Integrate security offices, parking offices, retail shops, etc. into parking facilities to provide increased activity levels.
- Consider CCTV, alarms, motion detectors and security patrols.
- Integrate parking attendants, cleaning and maintenance staff, shuttle drivers, etc. into your parking security program.
- Incorporate safety and risk management issues into a weekly facility walk-through checklist.

Characteristic #8 – Effective Communications

Best in Class parking operations actively engage other community groups to help define how the parking system can best support the objectives of the businesses and the community at large that depend on a “parking system that works.” As an outside consultant coming into a downtown to evaluate some aspect of a downtown parking program, it is not uncommon to find the parking system at odds with the downtown association. Although there may be as many reasons for this “disconnect” as there are personalities involved, there appears to be at least two primary underlying reasons:

- Downtown associations are driven by efforts to revitalize downtown areas and see parking costs as one element that places them at a competitive disadvantage (compared to the perception of “free parking” at the malls/suburbs). At the same time parking system managers are being pushed, usually by municipal governments, to generate revenues. The bottom line is they lack a shared vision and therefore are pulling in opposite directions.
- The second major issue typically has to do with service level expectations. Downtown associations tend to have higher expectations in the areas of customer service, facility cleanliness, security, etc. It is not that the parking system administrators do not value these same qualities, but there is a cost associated with providing these programs and limited budgets to support them. The irony is that revenues are often reduced by not providing these higher levels of service.

The first step towards resolving this problem is improved communications and the definition of a shared vision/mission. A clear understanding of the issues and potential solutions is the kick-off point for developing the needed mutually beneficial approach. Developing a set of “Guiding Principles” for the parking system is good starting point for crafting a successful collaborative relationship.

Successful programs also have well-defined relationships between various departments, especially other support departments such as: Maintenance, Enforcement, Security/Police, Communications, Facilities Management, Planning, etc.

Finally, successful parking programs are in touch with their customers and actively solicit input through meetings with major downtown employers, customer surveys, websites, parking “hot-lines” and public forums.

Characteristic #9 – Consolidated Parking Programs

Taking a systems approach to parking is an important dimension to creating a comprehensive and effective parking program. Having control of all or most aspects of parking can contribute to a more effective operation, because of the interactive nature of parking as a system.

For example – having control of off-street, but not on-street parking can lead to problems if the rates for the various types of parking are not kept in the proper balance or relationship. Or, not having control over parking enforcement practices can hamper efforts to promote or improve turnover to support downtown retail or to support special downtown events.

Ideally, the parking system should control off-street, on-street and parking enforcement operations. All parking related revenues should first go to fund parking programs, including preventative maintenance, maintenance reserves, parking system/downtown marketing, planning and new parking resource development. If additional revenues, in excess of

operational needs are available, they should be banked as reserve funds for future parking development projects or returned to the general fund for discretionary spending.

Characteristic #10 – Strong Financial Planning

The Parking System's financial expectations should be well-defined and understood. For example, is the parking system expected to be:

- A self-supporting entity?
- A profit/revenue center?
- A support service sustained by other primary revenue sources?

With the exception of airports, some university systems and some very large municipalities, parking programs are rarely capable of being totally self-supporting. Many factors including market rates for parking, parking mix (percentage of transient vs. monthly parkers), availability of on-street parking revenues, availability of parking enforcement revenues, politics, economic development policies, etc. have an impact on whether parking can be self-supporting. For systems that cannot achieve true financial self-sufficiency, a common goal is for the parking system to cover all operational costs, but not debt service costs. Debt service costs are typically subsidized by the general fund, tax increment financing revenues, in-lieu parking fees, or other sources.

An important principal in developing a successful parking program is that parking system revenues should be tied to the larger vision and mission of the downtown it is intended to serve. Development of a downtown strategic plan which incorporates not only market and land-use strategies, but also critical support infrastructure such as parking, transit, pedestrian access, freight mobility, loading and unloading, etc. is an excellent means for defining the relationships of all these components and establishing clear goals and direction. Once the vision and mission have been set, investigation of other possible sources of parking revenues may be desired.

Alternative parking revenue sources might include:

- On-street pay parking (if that does not already exist)
- Parking Enforcement
- Tax Increment Financing Districts
- In-lieu-of Parking fees
- Special Parking Assessment Districts

Other important financial planning elements that are recommended for all parking systems include:

- Having a consolidated parking financial statement that tracks all sources of parking revenues and expenses.
- Parking's revenues and expenses are well managed and its books are regularly audited.
- Annual operating statements are published in an annual report and available for public review. (For an excellent example of this, check out the annual parking report posted on-line by the Calgary Parking Authority. A simple Internet search for Calgary Parking Authority should get you to the annual report link.)
- If a private parking operator is contracted to manage day-to-day operations, an annual parking operations and financial audit is recommended.

Characteristic #11 – Creative, Flexible and Accountable Parking Management

This section encompasses so many potential topics it could easily be a whole book in itself. Therefore, we will only attempt to touch on some key issues and principles.

One key principle is that different land uses, environments and user-groups require different parking management approaches. A one-size-fits-all approach does not work. A variety of parking management strategies should be employed to address different needs, such as:

- Visitor Parking
- Employee Parking
- On-Street Parking
- Reserved Parking
- Residential Parking
- Special Use Permits
- Event Parking
- Accessible Parking (ADA)
- Shared Parking
- Parking Allocation Plans
- Loading/Unloading Zone Parking

Another key management principal is the need for strong and accountable parking revenue control systems. This begins with the purchase and installation of a parking access and revenue control system specified to meet your system's needs.

It is important to understand all the components of the parking access and revenue control system and utilize them to their full potential. Many parking systems purchase expensive systems and use less than 10% of the system's capabilities. Using standard parking access and revenue control system reports and creating customized reports can provide enhanced management information, improved understanding of operational dynamics and ultimately increased system utilization and efficiency.

Another characteristic of effective parking programs is that they have mapped out audit trails and developed processes to provide acceptable levels of control and accountability. Because of the large revenues generated, revenue control and accountability are key parking management issues.

Developing policies and procedures for anticipating and managing losses of parking supply (both temporary and long term) is another basic parking management responsibility. Some key elements in this area include:

- Planning for and communicating losses of parking supply
- Insuring adequate capacity to handle short-term parking supply losses
- Having effective plans to manage routine maintenance projects, including customer communications and contingency plans
- Having a full understanding of the financial impacts of these projects on revenue streams
- Having defined parking replacement cost policies is another recommended best practice.

Development of an "Annual Parking Report" can have a number of positive impacts for a parking system. It identifies key departmental issues and challenges, promotes departmental achievements, documents the "state of parking" to the stakeholders, creates a record of "system history," and builds credibility and confidence in the department.

Other parking management elements include:

- Well defined parking policies and procedures
- Development and maintenance of parking facility operations manuals
- Well defined and implemented facility maintenance programs
- Parking system marketing programs
- Effective parking and wayfinding signage programs.

Characteristic #12 – Operational Efficiency

Another area that is important to investigate when assessing a parking program is the overall efficiency of the parking operation. Parking system efficiency has several dimensions, depending on how the system is managed. The first area to be scrutinized is the management responsibilities of the system, i.e., what programs is the department or organization responsible for implementing. Once this has been defined, organizational structure and staffing plans are analyzed.

Development of some form of benchmarking or comparative analysis to measure costs and performance to similar operations is highly recommended. Understanding that benchmarking can be a tricky business – making sure you are comparing apples to apples, there are some basic benchmarks that make sense for downtown parking operations. For illustrative purposes, a few basic benchmarks include:

- Parking revenue per space
- Total operating cost per space
- Administrative cost per space
- Maintenance cost per space
- Citations issued per enforcement staff (FTE)
- Parking citation collection ratio

Other operational areas can also yield significant savings in terms of reducing costs. Take, for example, facility lighting. Utility costs are integral budget elements in managing a parking structure, but by placing the exterior bay and roof top lights on separate circuits with photo-cells, 25 – 35% of the facility's lights can be turned off during the day, saving significant amounts of electricity.

Another area worthy of investigation is staffing costs in the late evening hours when the income generated is less than the staffing costs incurred. In these situations, the use of “automated payment devices” can be an effective alternative.

Characteristic #13 – Comprehensive Facilities Maintenance Programs

Few things make a greater impression on first time visitors than the cleanliness and maintenance of your parking facilities. Beyond first impressions, however, few areas provide a greater potential return on investment than a comprehensive parking system maintenance program.

A few best practices related to parking facility appearance and maintenance are noted below.

- Paint interior surfaces white to enhance the perception of cleanliness and safety and improve lighting levels.
- Develop a comprehensive preventative maintenance program for all essential systems.
 - Parking Access and Revenue Control System

- Elevators
- Lighting and Energy Management Systems
- Organize and track parking facility warranties in a binder. Schedule warranty inspections six months prior to warranty expiration. Document inspections with digital photos (ideally with time/date stamps) and written reports.
- Regularly schedule facility condition appraisals by an experienced parking consultant and develop a prioritized program of facility maintenance repairs.
- Set aside adequate maintenance reserve funds based on a prioritized facility maintenance action plan

There are four general categories of parking facility maintenance:

1. Housekeeping – This work is typically conducted by in-house staff and consists of basic cleaning, sweeping, slab wash downs, etc. “Housekeeping” includes items such as:
 - Sweeping of the stairs, elevator lobbies and floors on a regular basis.
 - Trash collection on a periodic basis.
 - Slab wash downs on a semi-annual basis.
 - Floor drain cleanout (including sediment basket cleanout)
 - Cleaning of stair enclosures (stair, elevator, and storefront glass)
 - Cleaning of doors, doorframes and glass on a periodic basis.
 - Cleaning of signage, light fixture lenses, elevator floors, doors, walls, parking equipment, etc. on a periodic basis.
 - Cleaning of restrooms, cashiers booths, offices, etc. on a regular basis.
 - Daily walkthrough of the facilities by operator to confirm that housekeeping is being performed.

2. System Maintenance – This includes tasks necessary to ensure proper operations of systems and components. “System Maintenance” includes items such as:
 - Landscaping
 - Maintenance – leaves, lawn, trees.
 - Plantings (annual)
 - Fencing – posts, chains, etc.
 - Planters
 - Irrigation Systems
 - Painting – spot or seasonal painting.
 - Parking Equipment Maintenance
 - Ticket Issuing machines, card readers, computers, booths, gates, etc.
 - Annual maintenance contract with equipment supplier.
 - It is anticipated that parking equipment will be replaced every 7 to 10 years.
 - Fire Protection
 - Maintenance Contract is anticipated
 - Drain periodically
 - Testing (twice per year)
 - Lighting – It is anticipated that the lamps should be replaced every 2 to 3 years.

- Fixture repair and isolated replacement included in operations
 - Fixture replacement every 20 years (included in Capital Expenditures)
 - Lens Replacement every 6 years (with lamps, included in operations)
 - Lamp replacement on an as need basis – Operator should schedule lamp replacement by level to maximize light effectiveness, and to maintain economy (Note: Lamp intensity depreciates significantly, well before burnout)
 - Elevators – Elevator service contract and maintenance / repairs are generally provided by an outside maintenance firm.
 - Periodic cleaning of equipment will be reviewed.
 - Important to provide maintenance to reduce breakdowns.
 - Electrical / Mechanical / Plumbing Maintenance
 - Offices / Restrooms / Cashiers Booths
 - HVAC
 - Exhaust Fans
 - Plumbing fixtures
 - Hot water heaters
 - Lighting
 - Electrical Equipment – General and emergency cleaning / maintenance.
 - HVAC Equipment – General and emergency cleaning / maintenance
 - Mechanical ventilation
 - Elevator tower ventilation system
 - Emergency Power / Lighting Testing and Maintenance Contract.
 - Generator: Maintenance contract.
 - UPS System: Maintenance Contract
 - Plumbing – General cleanout
 - Domestic Water Maintenance
 - Drain wash down lines annually
 - Sump pump inspection
 - Doors and Hardware – Periodic inspection and lubrication (Malfunction, sticking, etc.).
 - Signage
 - Illuminated Signs – Replace lamps
 - Replace damaged signage periodically as required.
 - Snow Removal / Deicing
3. Annual General Maintenance and Repairs – Annual general maintenance would usually be performed by outside contractors, although in some cases the operator’s staff may perform the work. This work is not typically included in a capital cost budget, and may be combined with the System Maintenance category. “General Maintenance” would include items such as:
- Concrete Repairs - Isolated concrete slab, beam, joist, tee, topping, etc. repairs. In some cases, periodic concrete repairs (every 5 years) are included; however, isolated repairs between this interval should be anticipated.

- Masonry Repair – Isolated masonry repair should be anticipated (spot tuck pointing, damaged masonry unit replacement, resetting cap stone, etc.).
 - Sealants/Expansion Joint – Repair/replacement of isolated sealant (floor and façade) or expansion joint failure (not included under 5 year warranty). Leaking at slab cracks may also require sealant installation. Leaking joints should be repaired as soon as possible after discovery, and evidence of leaking should be removed.
 - Deck Coating - Isolated deck coating repairs (not included under the 5 year warranty). Wear of the topcoat should be repaired prior to damage to the underlying base membrane.
 - Painting – Painting touchup (spot / seasonal painting) should generally be performed as damage is observed. It is anticipated that repainting of exposed steel and concrete surfaces would be performed every 10 to 15 years, and parking stripes reapplied every 2 to 3 years.
 - Graffiti Removal – Graffiti removal should be completed as soon as possible after the application.
 - General Electrical Repairs and Maintenance - Isolated corrosion damage, switchgear maintenance, panel maintenance.
 - Light Fixture Repair / Replacement – Individual light fixture repair or replacement will require immediate attention.
 - HVAC – Office, Restroom and Elevator HVAC repairs.
 - Plumbing – Isolated replacement of drain lines and floor drain grates; Isolated cleanout of drains / lines; Periodic sump pump repairs.
4. Periodic Repairs, Protection, and Improvements (Capital Expenditures) This work is generally performed by outside contractors under the direction of parking consultants experienced in restoration and will consist of replacing/repairing damage to waterproofing or structural elements.

Annual Maintenance Costs by Category

Housekeeping, Operations, and Operator Maintenance will vary based on specific operations requirements, but will approximate \$350 to \$450 per space per year.

Annual General Maintenance and Repairs costs will approximate \$0.10 to \$.15/sf per year (\$35 to \$50 per space per year), depending on condition and type of structural system.

Periodic Repairs, Protection, and Improvements (Capital Expenditures) - The maintenance reserve fund can likely be lower during the first 10 years of life, and increased to accommodate improvement planning budgets. For a new structure, this item may range from \$75 to \$100 per space per year for the first 10 years.

Characteristic #14 – Effective Use of Technology

Best in Class parking operations almost always have a comprehensive and integrated parking access and revenue control system that offers the following benefits:

- Consistent operations and features for customers
- Simplified/consistent training for staff and auditors
- Similar equipment and models provides for simplified maintenance and less costly parts stocking
- Consolidated system-wide reporting and management information

Staying informed of new technologies can help provide the parking department with the best tools available to achieve its goals. New technologies can help you, and your staff, work smarter, not harder. Customer service levels can be enhanced through the use of Automatic Vehicle Identification (AVI) systems, web-based permit renewal programs, pay-on-foot payment stations, etc.

Other benefits of incorporating new technologies are improved overall efficiency and effectiveness, reductions in operating expenses, improved management controls and the ability to implement seamless, customer friendly payment system options such as Internet payment options.

Characteristic #15 – Parking System Marketing and Promotion

This is one of the most over looked aspects of parking system management. An effective parking system marketing and promotions program is one way to quickly set your parking operation apart from the ordinary. The following is a list of action items that can help launch a new or enhance an existing program.

- Develop a consistent Parking System Brand
 - The brand should promote the image you want people to have of the system
 - It should reinforce the positive aspects of the system – “Free and Easy Parking,” “Visit Downtown and Parking Is On Us,” etc.
- Use consistent signage to “tie the system together”
- Have a parking tie-in to all downtown promotional materials.
- Expand and improve parking system website
- Develop new employee/tenant parking brochures or info packets
- Develop parking “E-Bulletins”
- Designate a parking spokesperson
- Regular personal contact with customers
- Develop parking deck floor identification (Themed graphics, music, etc. could be considered an extension of a local public arts program)
- Develop cooperative relationships between public and private parking operations to promote efficient use of resources for large public events.
- Develop a parking information database
- Use billing system to distribute system info and promotional materials
- Utilize “Guerilla Marketing” (creative/low cost concepts) techniques.

Characteristic #16 – Positive Customer Service Programs

Downtown businesses depend on a parking system that works and contributes to a positive experience of the downtown. Because parking is the first and last impression customers visiting the downtown will have, providing a high level of customer service is critical. When weighing the importance of customer service, consider these statistics:

- An average business never hears from 96% of its unsatisfied customers.
- On average, for every complaint received there are 26 customers with problems.
- The average unsatisfied customer tells 9-10 people about their problem.
- Customers who have had the problems solved tell, on average, 5 people.

A strong customer service program can provide the following benefits:

- Helps create a more “friendly” atmosphere

- Improves the image of the Parking Department and the Downtown
- Contributes to increased facility utilization (and therefore revenue)
- Contributes to increased acceptance of, and adherence to, parking regulations

What are some characteristics of bad customer service?

- Indifference
- Unfriendliness
- Runaround
- “Joe Rule-Book”
- Not listening
- Getting the Brush-off
- Just going through the motions
- No follow-up

What are characteristics of good customer service?

- Always be friendly and respectful
- Allow customers to fully explain their situation, without interruption (let them vent)
- “Actively listen” to what your customers say
- Ask questions seeking clarification
- Maintain eye contact
- If the customer is making a complaint, always apologize for the situation (and mean it!)
- Explain what you can do for the customer, not what you can’t
- Always remember that tone of voice and physical movements convey meaning
- Walk through the service process with the customer, explain the options
- Help the customer understand the options and achieve a level of buy-in
- Make sure they know you are there to help
- Always conclude a service opportunity with a thank you
- If possible, follow-up with the customer to see if the solution worked and if they are satisfied

Other recommended strategies to improve customer service include:

- Focus on employee training and good hiring practices
 - Hire friendly, attentive, outgoing knowledgeable attendants
- Increase personal contact between the parking system manager, stake holders and customers
- Institute performance measurements and utilize for company and employee incentives
- Create and implement a parking services program (battery jumps, lock-outs, flat-tires, escorts, audio book check-out, etc.)
- Implement a “Parking Hot Line” – (immediate response, centralized, easy to remember [555-PARK], follow-up)
- Improve website and links (use as a customer service tool, pay fines, order info, such as downloadable maps, rate schedules, special event info, etc.)
- Measure program effectiveness (customer surveys, etc.)
- Implement a secret shopper program to evaluate customer service

- Implement customer friendly systems such as AVI
- Develop a “New Employee Parking Brochure/Information Packet” to make it easier for larger organizations to get their employees into the system.

Characteristic #17 – Special Events Parking Programs

Coordinating parking for special events, almost more than any other parking management activity, requires a coordinated and cooperative effort with the larger community. Some of the keys to success in this area include the development of a well-defined special events policy and detailed system for coordination of special events.

Another important dimension is the development of strong relationships with the key stakeholder groups that are active in the downtown. Providing practical incentives for other groups to communicate with and include the Parking Department in their planning processes early on is critical. Examples of the incentives parking can provide includes special services such as: coordination services, parking validations, waiving of parking enforcement, etc. for those who participate in the special event planning process.

Finally, be consistent in providing those that work with the parking system a high level of service. Conversely, provide disincentives for those that ignore the special events parking policy or chose to not include parking in their planning.

Characteristic #18 – Effective Enforcement

Having an effective parking management program requires that the rules and regulations be enforced. The key to an effective parking enforcement program is attitude, consistency and fairness. Best in Class operations have adopted the philosophy of being customer focused not revenue or violator focused.

The following are enforcement program elements that help assure that your program avoids some common pitfalls.

- Define who is responsible for day-to-day parking enforcement. Have a central number that everyone knows to call for info regarding parking enforcement (eliminate the run around).
- Assure that parking rules, regulations and consequences are clearly posted.
- Assure that if towing or booting is a possibility, that the number to call for towed/booted vehicles is clearly posted.
- Define how enforcement revenues are to be collected and used.
- Define who sets enforcement policies.
- Have a clearly stated process for adjudicating parking citations.
- Define who has the authority for towing, booting or other enforcement practices.
- Make paying for parking citations as easy as possible.
- Provide incentives for early citation payment and disincentives for late or non-payment.

Characteristic #19 – Parking and Transportation Demand Management

Because the cost of providing parking can be so high, strategies to manage parking demand is an important consideration in parking system planning. Incorporating parking and transportation demand management also ties into environmental goals and objectives such as the desire to reduce pollution, decrease traffic congestion, reduce reliance on single occupant vehicles, etc. When evaluating options to reduce parking demand, integrating transportation demand management (TDM) strategies into your parking program philosophy is a recommended strategy. A few best practices include:

- Use parking pricing and rates as tools to promote desired behaviors
- Take advantage of employer-paid and employee-paid pre-tax benefit options
- Promote carpool/vanpool programs
- Provide preferred parking for carpools/vanpools
- Subsidize transit passes for downtown employees
- Provide a “Guaranteed Ride Home” program for those who participate in transportation alternative programs.
- Integrate bicycle racks and storage lockers in parking facilities.
- Show transit stops on parking maps
- Provide remote parking options and promote park and ride options on the parking web site

Characteristic #20 – Awareness of Competitive Environment

Another characteristic of effective parking programs is that they are keenly aware of their competitive environment. They actively monitor private sector parking operators for changes in rates, new services offered, new technologies being used, etc. One of the most fundamental practices that all parking programs should engage in is a formalized process for evaluating parking market rates. It is recommended that parking market rate surveys be conducted bi-annually to help maintain an awareness of the competitive climate. This information can also be valuable during annual budget planning.

Another dimension to staying competitive is being aware of what parking systems in other municipalities are doing. What has been tried? What has worked? What hasn't? Participating in national, regional and state parking associations, sending key staff to parking conferences and implementing the peer-review process discussed under the Staff Development section earlier are good ways of developing a network of contacts to help you stay up-to-date on the latest technologies and management practices.

Summary

The importance of Parking as one of the most visible and often controversial elements of a downtown's infrastructure is often underestimated. Parking, when well-managed, can be a key component in attracting and supporting new development and is essential to sustaining healthy and vibrant downtowns.

Parking System Operating Methodologies

The following document provides an overview of parking system “operating methodologies” for parking programs. Potential advantage and disadvantages of each of the three primary operating methodologies are discussed.

Self-Operation

Self-operation of the parking system requires that the owning entity provide all the necessary employees (e.g., full or part-time staff and/or temporary employees), equipment, supplies, etc. With this method of operation, the owning entity receives all gross parking revenues and pays for all operating expenses. Self-operation requires internal administrative and managerial staff at a higher level than the management contract or concession style agreements.

Self-operation allows the owning entity to have complete control over the parking facilities and the level of service provided to its patrons. This requires a well-trained and experienced staff to effectively manage a large parking operation with significant daily revenues. Parking has become a highly specialized field and also requires good general and facility management skills. Without proper training and professional development, self-operation can result in a lower than desired level of service and revenue controls. This, in conjunction with the requirements for a high level of customer service and the specialized nature of parking, makes the idea of using a professional parking management firm a logical and attractive alternative for initial downtown parking operations.

Potential advantages of self-operation include:

- Complete control over day-to-day parking operations, including customer service.
- Internal parking knowledge to assist with future planning.
- Uniform look and feel with other city services.
- Better control over staff and staff training.
- Eliminates paying a management fee to a vendor.

Disadvantages to this approach would include:

- Typically higher expenses than contracting with a private parking provider due to:
 - Higher pay rates than private operators especially in a unionized environment
 - More restrictive benefit requirements
 - Higher staff training and development costs
 - Private operators have a greater economy of scale relative to supplies
 - Higher insurance costs/requirements.
- More operational duties for the city.
- Smaller staff pool to draw from for covering sick days and vacations.
- Without adequate training, customer service could suffer.

- The city would need to find and hire experienced parking staff.
- The city would have higher administrative and back office costs than an experienced private operator.
- The city would deal directly with customer complaints.
- The city would assume all of the financial risks related with the parking system.
- Can be more difficult to terminate the employment of staff when needed.

Management Agreement Operations

In this form of operation the owning entity retains complete control over staffing levels, validation policies, parking rates, and customer service policies. With a management agreement, the parking operator provides the necessary labor and services for the operation of the parking facilities in accordance with an agreed upon policies and annual operating expense budgets established by the owner. The parking operator then receives a monthly payment, either a lump sum amount or a percentage of the gross or net revenue. This monthly payment represents the fee to manage the facilities.

The parking operator should provide the owning entity with a detailed monthly report package including: operating statistics, revenue summaries, expenses summaries, budget variance reports, etc. The management agreement still requires some additional personnel time for the owning entity's staff, since it is necessary to audit the gross parking revenues, as well as the monthly operating expenses. The preferred arrangement is that all reporting guidelines and accounting practices are determined up-front so that each party understands their responsibilities.

The owning entity's stakeholders and staff should have significant input into establishing the "level of service" for the parking system by deciding on the type of parking access and revenue control systems to be employed, the quantity of cashiers/customer service ambassadors, acceptable traffic queuing upon exit, lost ticket/insufficient funds policies, parking related services offered (lost vehicle assistance, dead battery assistance, vehicle lock-out assistance), etc.

The following outlines the potential advantages of outsourced day-to-day operations via management agreement (in conjunction with a small in-house contract management function):

- Reasonable control over day-to-day parking operations.
- An internal parking manager could be hired by the city with sufficient parking knowledge to assist with future planning.
- A well-structured management agreement would provide:
 - Reasonable control over staff and staff training.
 - High customer service expectations.
 - A high level of staff appearance.
 - Strong auditing capabilities
 - Operator accountability.
- Parking services from an experienced service provider.
- Typically, operations are less expensive due to:
 - Lower staffing costs.
 - Lower supply costs.

- Lower training costs.
- Lower administrative costs.
- Lower insurance costs.
- The use of a private parking operator, at least for a short time, would provide valuable parking experience to the city.
- Potentially, a large pool of private operator staff to draw from for sick day and employee vacations.
- The contracted parking operator would deal with most customer complaints.
- Relatively predictable parking system expenses.

Disadvantages to this approach include:

- The city would have to compensate a private operator with a management fee or a percentage of gross revenues.
- Somewhat less control over day-to-day operations.
- Somewhat less control over staffing and training issues.
- The city would need to find and hire an experienced parking manager.
- The city would have some administrative and back office staffing costs.
- The city would assume most of the financial risks related with the parking system.

Concession Agreement Operations

With a concession agreement, the concessionaire will provide all necessary labor and services for the complete operation of parking facilities in return for a percentage of the gross parking revenues. The actual percentage varies from operation to operation based on the size, complexity, revenue potential, and perceived risk to the operator. There may be a guaranteed minimum annual payment to the owning entity. Sometimes a revenue split is negotiated for revenues above a certain level.

In general, concession agreements work best in situations where the owning entity wishes to divest itself from the day-to-day parking operational concerns in order to better focus on its core business (these types of arrangements are more common in airports for example). With this type of agreement, a minimal amount of time is required by the owning entity's staff in the day-to-day operations of the parking program. The owning entity also gives up some level of control as it relates to defining day-to-day operations, as the concessionaire is responsible for all expenses and most liabilities. Typically, the owning entity receives a deposit from monthly parking revenues within two weeks after the end of the each calendar month. Periodic conversations with the parking operator are necessary to discuss operational issues that affect the quality of service to owning entity's patrons.

The concession agreement is the simplest type of agreement for administrative purposes, in that only the gross parking revenue need be audited. All operational expenses are the responsibility of the concessionaire, thereby resulting in minimal control of this function by owning entity staff. Also, as with the management agreement, the parking operator serves as a buffer to the owning entity's management with respect to parking complaints and potential wrongdoing by those employed within the parking system.

Potential advantages of concession style leasing of parking facilities include:

- No real parking operations or management required by the city.
- No substantial daily auditing required by the city.
- Facilities would be leased to an experienced parking services provider.
- Requires no internal parking experience on the part of the city.
- Relatively predictable revenue stream.
- Less operations related financial risk.
- Parking operator takes all significant parking customer complaints.

Disadvantages to this approach would include:

- Little to no control over day-to-day parking operations.
- No control over staffing and training issues.
- Less customer service accountability.
- Difficult to measure parking system expenses, if the parking operator is required to share them at all.
- The parking operator may be encouraged to reduce facility expenses to a minimum level (negatively impacting customer service), to increase profits.

Parking Facility Design Considerations

The following is a discussion of recommended parking facility design considerations. As the Town of Mammoth Lakes considers a range of potential parking facility sites to address future parking capacity and economic development goals, applying these design considerations to the various sites can provide a level of direction and guidance related to the site assessment process.

Site Requirements

Large and rectangular shaped sites are ideal for parking structures. Although flat sites are generally more economical to develop, sloped sites can provide design opportunities such as access on different levels and/or no ramping between levels. For a reasonably efficient parking layout, double-loaded parking “bays” range in width from about 54 to 60 feet, depending upon the angle of parking and the width of the parking space. The overall width of the structure should be determined based upon multiples of the chosen parking bay width. An ideal length for a parking structure is at least 240 feet. Longer sites provide the opportunity to park along the end bays, which provides more parking spaces, improves efficiency, and lowers the cost per space. A longer site also allows for shallower ramps which provide improved user comfort.

Generally, parking bays should be oriented parallel to the longer dimension of the site and preferably in the predominate direction of pedestrian travel. Walking distance tolerances from parking to a primary destination are typically 200 to 300 feet for shoppers, 500 to 800 feet for downtown employees, and 1,500 to 2,000 feet for special event patrons and students.

Site Constraints

Other site issues to be considered when evaluating a potential site for a suitable parking facility include the following:

- **Site Survey** – a topographic survey of the site is a very important precursor to developing a conceptual plan. The site survey should delineate property lines, easements, and utility lines.
- **Site Slope** – The topographic information will define the slope of the site. Sometimes the slope of a site can be used to reduce internal ramping in a parking structure, resulting in significantly lower costs. A parking structure that is built into a hillside can also reduce the visual mass of the facility.
- **Geotechnical & Soils** – Obtaining a soils report with sample borings and a geotechnical analysis early in the design process is prudent. If soils with poor bearing capacity are present on the site, the added cost for structural foundations can be significant.
- **Codes and Ordinances** – Municipal ordinances often specify setbacks, building height and bulk limitations, floor area ratio to site area, etc. that can significantly affect the allowable area on a site for a parking structure. The local planning organization may also impose development guidelines that must be followed.

Concept Design

Much of the remainder of these guidelines addresses issues and elements of parking structures that should be considerations during the conceptual design phase.

Parking Structures for People

An overall design principal to keep in mind is that parking structures are for people. Designing to accommodate the users of a particular structure will help produce a better parking structure.

- Different user types will have different needs.
- Some user types may need to be physically separated to ensure revenue control or for security reasons.
- Different users require different pedestrian circulation systems.
- Parking space widths and circulation geometry needs vary depending on the user type.
- Some vehicular circulation systems are better for specific user types:
 - Residential – Regular users enter and exit two times a day.
 - Education – May have peak loads in and out.
 - Hotel – Overnight guests, maybe event parking too.
 - Office – Low turnover. Regular users enter and exit two times a day.
 - Health Care Visitors –Wayfinding very important. Need to accommodate elderly drivers and passengers.
 - Health Care Staff – Shift time overlap and loading. Security issues, particularly at night.
 - Retail – High turnover. Occasional users - wayfinding to and from vehicle.
 - Elderly or Families with Small Children – Wayfinding again important. May need larger spaces and more elevators.
 - Events – Easy quick loading and unloading of structure. Multiple vehicular paths. Consider revenue collection methods, typically a flat fee on entry. Provide queuing space. Consider pedestrian flow to event - avoid crossing traffic.
 - Multiuse Garages – These guidelines focus on parking garage design for downtown Boise. Most of the garages in downtown will serve at least two user groups – short-term and long-term parkers – and may serve many other user groups. This is due to the fact that future garages will be located in activity centers that include office, entertainment, special event, restaurants, retail, lodging, and residential land uses – all of which have different parking characteristics. Attention should be given to creating entry, exit, and circulation designs that are flexible and adaptable to particular situations. Dual exit lanes that allow parkers with passes to exit quickly without having to wait in line with parkers who are paying should be considered to lower frustration levels for customers.

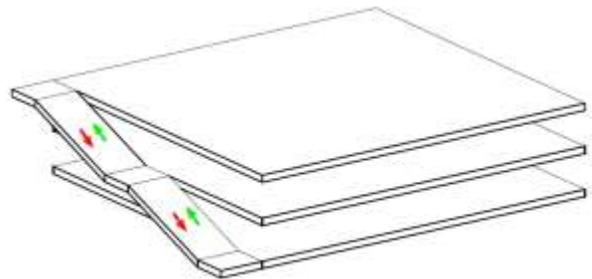
Circulation and Ramping

The basic circulation element for a parking structure is a continuous ramp with parking on both sides of the drive aisle. In a continuous ramp structure, some of the parking floors are sloped in order for traffic to circulate from one level to another. Only on a sloping site that permits direct access to each level from the exterior roadways are ramps unnecessary; but they still may be desirable for internal circulation.

The basic criteria for choosing a circulation system are the simplicity or complexity of the system and the architectural compatibility. Ingress and egress capacities are also a consideration in the selection of a circulation system. Some circulation systems provide the opportunity for level façades which may be desirable.

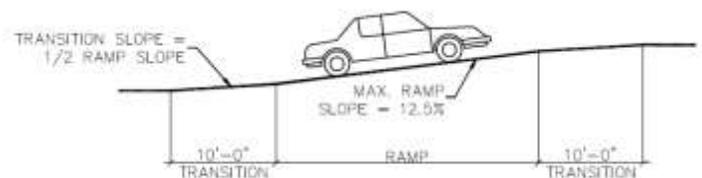
A parking ramp slope of 5% or less is preferred, although parking ramp slopes up to 7% are tolerated by the public in very dense urban areas. Parking ramp slopes should not exceed a 6.67% slope, which is the maximum parking slope permitted in the International Building Code (IBC). The acceptable ramp slope must also conform to the current Boise City Building Code.

Non-parking ramps are often employed at airports, casinos, large retail structures, for special event structures, and on small and irregularly shaped sites. Non-parking ramps consist of circular helixes (most common), express ramps (external), and speed ramps (internal). Non-parking ramp slopes should have a maximum slope in the 12% to 14% range. Non-parking ramp slopes up to 20% are sometimes considered if covered or equipped with snow melt systems.



Parking structures with non-parking ramps tend to be less efficient in terms of square feet of structure per parking space which directly increases the construction cost per parking space.

A grade difference of 8% or more requires transition slopes so vehicles do not bottom out. Recommended are minimum 10'-0" transition slopes at the top and bottom of the ramp that are one-half of the differential slope. For instance, two 10'-0" transition ramps sloped at 6.25% would be required at the bottom and the top of a ramp sloped at 12.5%.



One-Way vs. Two-Way Traffic

One of the primary factors in the design of parking structure is determining the traffic flow: one-way or two-way. Typically, a parking bay for a one-way traffic flow is narrower than for a two-way flow. The available site dimensions will influence the parking bay width and thus also

influence the circulation pattern. There are advantages and disadvantages to both circulation patterns. One-way traffic flow should never be combined with 90° parking. In parking facilities with one-way traffic flow, the angle of the parking stalls establishes the direction of vehicle traffic.

Primary Advantages of One-Way Traffic Flow:

- Easier for parkers to enter/exit parking spaces.
- Vehicles are more likely to be centered in angled spaces.
- Less circulation conflict and reduced potential for accidents.
- Better visibility when backing out of a stall.
- Separation of inbound and outbound traffic and improved flow capacity of the circulation system.
- The intended traffic flow is self-enforcing.
- One-way traffic allows the angle of parking to be changed to accommodate changes in vehicle sizes.

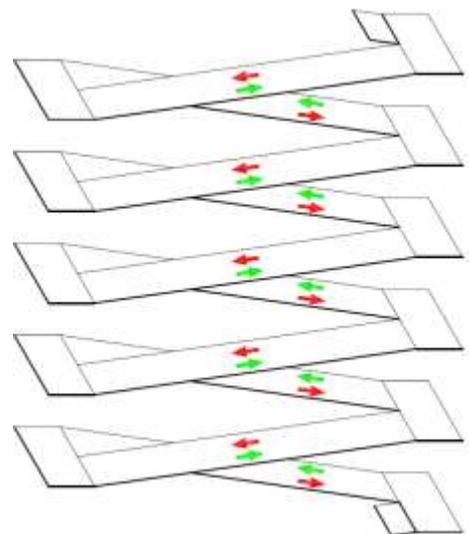
Primary Advantages of Two-Way Traffic Flow:

- Wider drive aisles allow parkers to pass other vehicles.
- Wider drive aisles are safer for pedestrians.
- Better angle of visibility when searching for a parking space.
- Traffic flow follows its own pattern rather than one that is forced.
- Two-way traffic and 90° parking makes more efficient use of parking aisles (more spaces in a run).
- Two-way parking facilities can essentially operate as one-way facilities when there is heavy directional traffic.

Major Parking Garage Circulation Systems

Single Threaded Design

In order to develop a reasonably efficient free-standing parking structure, the **minimum** dimensions needed are about 122 feet in width by 155 feet in length. A width of 122 feet allows for a two-bay facility with two-way traffic flow and 90-degree parking. A facility with two-way traffic and a five-foot rise along each bay requires approximately 155 feet in length for a minimum floor-to-floor height of about ten feet. That is, one 360-degree turn within the facility equates to a vertical rise of ten feet. A structure in this configuration has sloping floors along both façade sides. However, sloping floors can make façade treatments challenging. On larger sites that allow a structure length of about 255 feet, one bay can be sloped rising 10 feet



with opposite façade having a “level” floor.

Because of the number of 360° turns needed to ascend in a single threaded structure, the number of levels (floors) should preferably be limited to a maximum of six, otherwise the number of turns required and the number of spaces passed becomes inconvenient. A structure with a two-bay single thread design has a capacity for a maximum of approximately 750 spaces. The isometric diagram to the right represents a two-bay single-threaded helix.

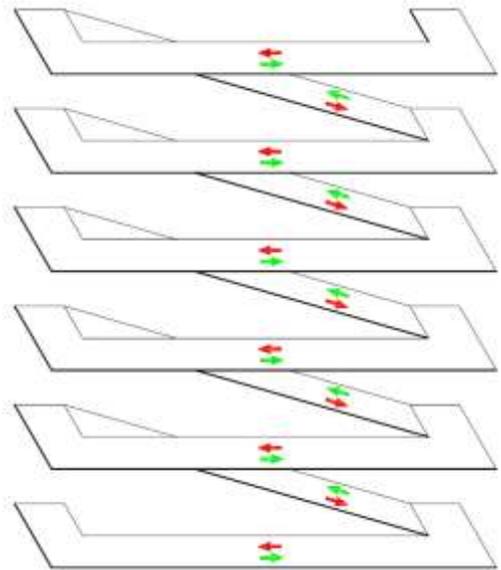
Single Threaded Helix with Sloping Floors

Primary Advantages of a Single-Threaded Helix:

- Repetitive and easy to understand for users.
- Potentially more flat-floor parking and level façade elements.
- Better visibility across the structure, which enhances security.

Primary Disadvantages of a Single-Threaded Helix:

- More revolutions required going from bottom to top and top to bottom.
- Two-way traffic bays have less flow capacity than one-way traffic bays. Traffic in both directions is impeded by vehicles parking and vacating a space.

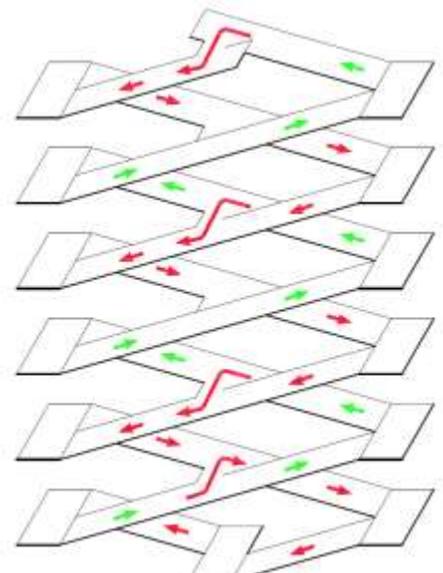


Single Threaded Helix with One Level Bay

Double Threaded Design

A facility with a one-way circulation system and angled parking can be provided in a double-threaded helix with modules ranging from 54 to 58 feet in width, depending upon the angle of parking. The preferred angles of parking for an efficient layout are 60°, 70° and 75°. A double thread, which requires a ten-foot rise along each module, requires 240 feet in length. More efficient layouts can be achieved on longer sites. The isometric right represents a two-bay double-threaded helix with one-way traffic.

A double-threaded helix can work with either one-way or two-way traffic flow, although one-way traffic is more common. A two-way double threaded design can be configured as two separate structures with no vehicular connection. A double-threaded helix rises two levels with every 360 degrees of revolution, which allows for two



One Way Double Threaded Design

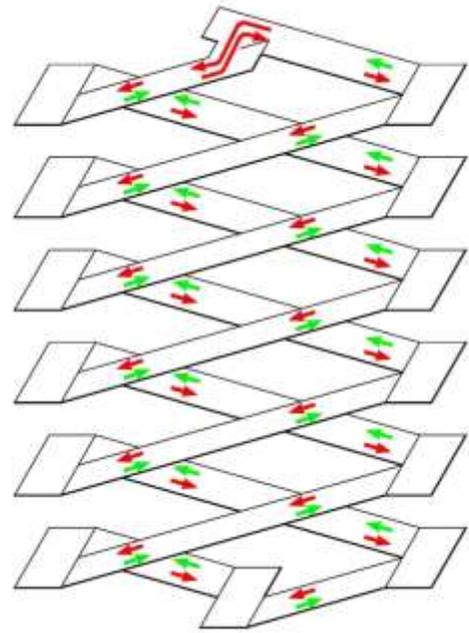
intertwined “threads” and the opportunity to circulate to an available parking space without passing all parking spaces as inbound and outbound traffic can be separated. Because of this, double-threaded helices are often recommended for larger facilities with seven or more levels. A two-bay double thread has a functional system capacity for up to approximately 2,000 spaces with angled parking and one-way traffic flow.

Primary Advantages of a Double-Threaded Helix:

- Efficient circulation and more traffic flow capacity
- Pass fewer spaces both inbound and outbound.

Primary Disadvantages of a Double-Threaded Helix:

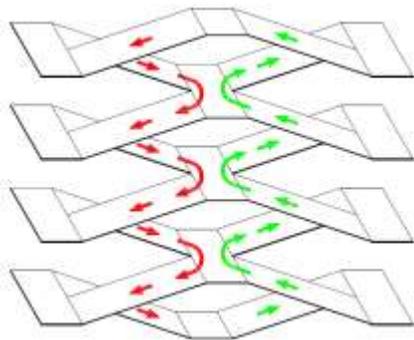
- Can be complex and confusing, particularly in finding one’s vehicle upon return to the parking facility.
- Two-sloped bays and minimal flat-floor parking.



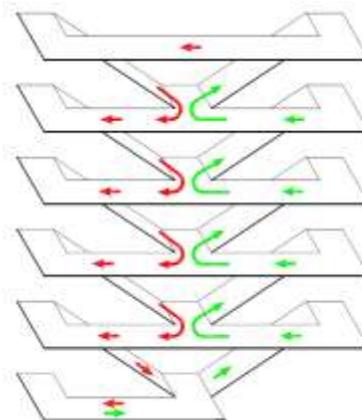
Two Way Double Threaded Design

Other Circulation Systems

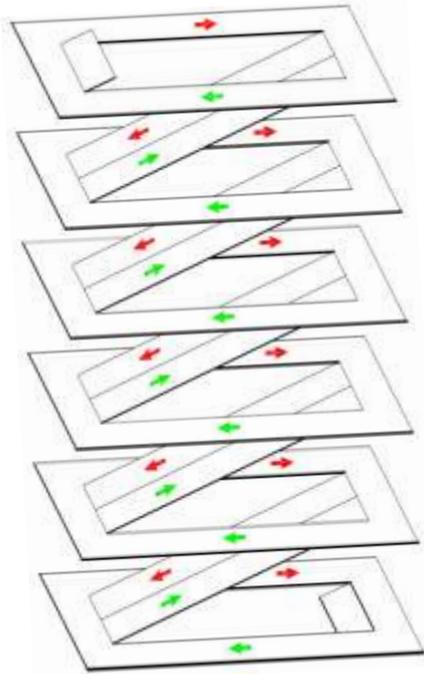
There are other parking and circulation systems that are often used in parking structures.



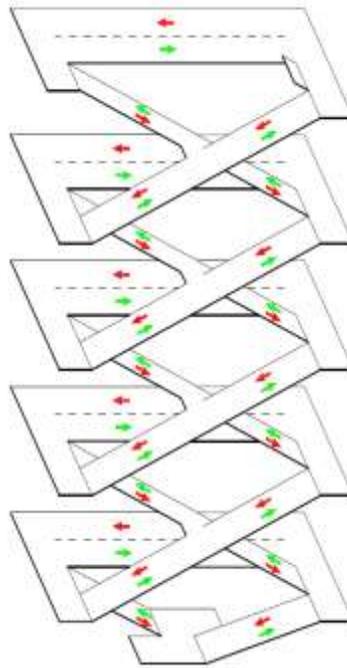
End-to-End Helix Both Bays Sloped



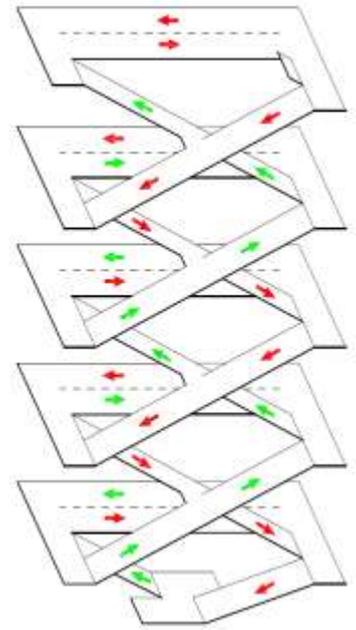
End-to-End Helix One Bay Sloped



Side-by-Side Helix



Two-way Double Threaded
w/ Flat Bays



One-way Double Threaded
w/ Flat Bays

Access Design

Vehicle entrances should be visible and easily identifiable. The minimum distance of entry/exits from corner intersections is at least 75 to 100 feet (preferably 150 feet). Entrances and exits should have clear lines of sight. It is preferable to enter a facility from a one-way street or by turning right from a two-way street and to exit a facility by turning right on a low-volume street. High traffic volumes and left turns can slow exiting and cause internal traffic backups. Consideration should be given to acceleration/deceleration lanes on busy streets. Gates should be located far enough away from the street to allow at least one vehicle behind the vehicle in the service position (at a ticket dispenser, card reader or cashier booth) without blocking the sidewalk. Entry/exit areas that have parking control equipment should have a maximum 3% slope.

It is very important to provide the appropriate number of entry/exit lanes to meet projected peak traffic volumes. The number of lanes is a function of user groups served, peak-hour traffic volumes, and service rates of the parking control equipment. It is recommended to have a parking professional prepare a lane and queuing analysis to guarantee sufficient entry and exit capacities.

Cross-traffic at entry/exits should be minimized and preferably eliminated. When placing vehicle entries and exits together on one-way streets it is preferable to avoid "English" traffic conditions where traffic keeps to the left instead of to the right. Pedestrian/vehicular conflicts should be minimized by providing a pedestrian walkway adjacent to entry/exit lanes. Stair/elevator towers should be located so pedestrians do not have to cross drive aisles on their way to primary destinations.

Important Issues for Vehicle Entry and Exit Lanes:

- The approach and the departure area from the lanes will also affect the rate of flow into or out of the structure. Tight turns equal a slower throughput.
- Pedestrian safety at entry and exit portals is paramount. Consider the vision cone of drivers entering or exiting the facility.
- Check and recheck vehicle turning radii at all entry / exit lanes and adjacent ramps.
- Vehicle queuing analyses should be performed to ensure traffic does not back-up onto the exiting street system or the inside of the facility during peak periods of traffic flow.

Parking Geometrics

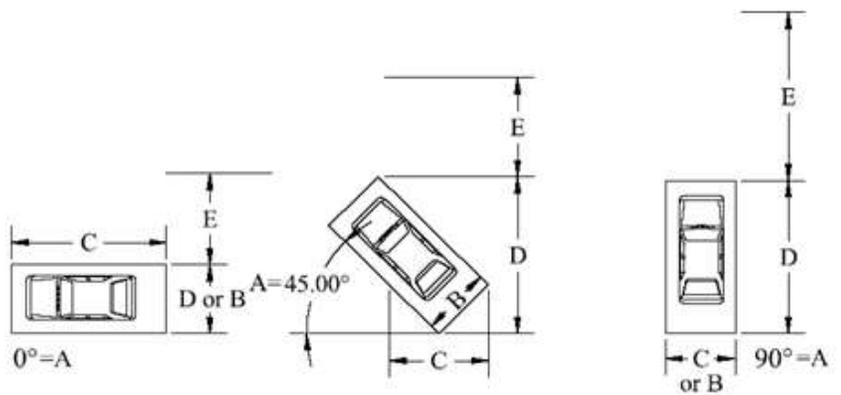
Parking geometrics refers to parking stall and drive aisle dimensions. Parking dimensions have been developed to comfortably accommodate the composite design vehicle, which refers to the dimensions of the 85th percentile vehicle in the range of vehicles from smallest (zero percentile) to largest (100th percentile). The composite design vehicle is the size of a Ford F150 truck (6'-7" x 17'-3").

The table on this page illustrates typical parking geometrics by parking angle for standard and compact spaces.

Parking Angle	Stall Width	Curb Length Per Car	Stall Depth	Driveway Width
A	B	C	D	E
0°	9'-0"	23'-0"	9'-0"	12'-0"
20°	9'-0"	26'-4"	15'-3"	11'-0"
30°	9'-0"	18'-0"	17'-8"	11'-0"
40°	9'-0"	14'-0"	19'-6"	12'-0"
45°	9'-0"	12'-9"	20'-5"	13'-0"
50°	9'-0"	11'-9"	21'-0"	14'-0"
60°	9'-0"	10'-5"	21'-10"	16'-0"
70°	9'-0"	9'-8"	21'-10"	18'-0"
80°	9'-0"	9'-2"	21'-4"	20'-0"
90°	9'-0"	9'-0"	20'-0"	22'-0"

MINIMUM STANDARDS FOR COMPACT VEHICLES

Parking Angle	Stall Width	Curb Length Per Car	Stall Depth	Driveway Width
A	B	C	D	E
45°	7'-6"	10'-6"	16'-0"	11'-0"
60°	7'-6"	8'-9"	16'-9"	14'-0"
75°	7'-6"	7'-10"	16'-4"	17'-5"
90°	7'-6"	7'-6"	15'-0"	20'-0"



The table below lists parking geometrics by a Level of Service (LOS) approach. Traffic engineers developed the LOS approach to classify traffic conditions on roadways from A (free flow) to F (gridlock). The LOS approach has been adopted by many parking consultants to help classify conditions in parking facilities. The recommended LOS categories for parking geometrics are as follows:

- LOS A = Excellent
- LOS B = Good
- LOS C = Acceptable

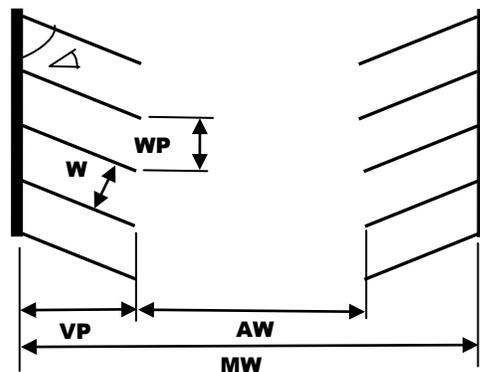
LOS criteria should be related to the needs and concerns of users. Generally, users with low familiarity and high turnover should be accorded a higher LOS. We recommend minimum LOS B geometrics for moderate to high turnover parking (visitor, retail, etc.) and minimum LOS C geometrics for low turnover parking (employee, commuter, resident, etc.).

PARKING LAYOUT DIMENSIONS

Stall Parking Angle	Stall Width Projection (WP)	Module Width (1) (MW)	Vehicle Projection (VP)	Aisle Width (AW)
LOS Factor A w = 9'-0"				
45	12'-9"	49'-10"	17'-7"	14'-8"
50	11'-9"	51'-7"	18'-2"	15'-3"
55	11'-0"	53'-0"	18'-8"	15'-8"
60	10'-5"	54'-6"	19'-0"	16'-6"
65	9'-11"	55'-9"	19'-2"	17'-5"
70	9'-7"	57'-0"	19'-3"	18'-6"
75	9'-4"	58'-0"	19'-1"	19'-10"
90	9'-0"	62'-0"	18'-0"	26'-0"
LOS Factor B w = 8'-9"				
45	12'-4"	48'-10"	17'-7"	13'-8"
50	11'-5"	50'-7"	18'-2"	14'-3"
55	10'-8"	52'-0"	18'-8"	14'-8"
60	10'-1"	53'-6"	19'-0"	15'-6"
65	9'-8"	54'-9"	19'-2"	16'-5"
70	9'-4"	56'-0"	19'-3"	17'-6"
75	9'-1"	57'-0"	19'-1"	18'-10"
90	8'-9"	61'-0"	18'-0"	25'-0"

Stall Parking Angle	Stall Width Projection (WP)	Module Width (1) (MW)	Vehicle Projection (VP)	Aisle Width (AW)
LOS Factor C w = 8'-6"				
45	12'-0"	47'-10"	17'-7"	12'-8"
50	11'-1"	49'-7"	18'-2"	13'-3"
55	10'-5"	51'-0"	18'-8"	13'-8"
60	9'-10"	52'-6"	19'-0"	14'-6"
65	9'-5"	53'-9"	19'-2"	15'-5"
70	9'-1"	55'-0"	19'-3"	16'-6"
75	8'-10"	56'-0"	19'-1"	17'-10"
90	8'-6"	60'-0"	18'-0"	24'-0"

Note: (1) Wall to wall, double loaded aisle.



We recommend using "one-size-fits-all" parking spaces rather than segregating standard and small car spaces. However, if they are used, small car spaces should not exceed 15% to 20% of the total capacity of a facility.

Parking Layout Efficiency

Parking Efficiency is expressed in square feet of construction per parking space. Parking efficiency directly correlates with the construction cost per space. Build less structure per space and the cost per space drops. Non-parking speed ramps for example increase the square feet per space.

Parking efficiency should be calculated considering the total parking structure size including the stairs and elevators and non-parking ramps. Any retail space that is incorporated within the structure is also usually included in the calculation.

Typical ranges of parking structure efficiencies are:

- Short Span Structural System = 330 to 390 Square Feet per Space
- Long Span Structural System = 300 to 340 Square Feet per Space
- Mixed Use Developments with retail, residential and parking can be as high as 400+ square feet per space

Parking efficiency makes a big difference – example:

- 360 sf / space X 500 spaces X \$45 / sf = \$8,100,000
- 330 sf / space X 500 spaces X \$45 / sf = \$7,425,000

A difference of \$675,000 or \$1,350 per space!

Pedestrian Requirements

Pedestrian traffic is equally as important in a parking structure as vehicle traffic. A safe, secure and well signed pedestrian path must be provided. Pedestrian access at the grade level should be separated from vehicular ingress and egress. Pedestrian access is usually adjacent to stair/elevator towers. It is also desirable to place a dedicated pedestrian aisle adjacent to a vehicle entry/exit because pedestrians are naturally attracted to these openings. Maximum lines of sight for both pedestrians and vehicles should be provided, and mirrors and warning devices should be incorporated when necessary. Access locations should be restricted to a few locations for security reasons.

A minimum of two stairs are required to meet code-required means of egress for fire exits in parking structures. Stairs shall be open or glass enclosed and be visible to the street for security reasons. The minimum stair width in parking structures is 44" and wider stairs are required for special events. Travel distance between exit stairs is specified in the IBC and is a maximum 300 feet without a sprinkler system and 400 feet with a sprinkler system. Stairs are usually placed in dead corners.

Elevators should be located at terminus in the direction of pedestrian travel. Hydraulic elevators can be used for up to 5 levels or 50' to 60'. Traction elevators should be used beyond 5 levels.

The minimum capacity and size is 3,500 lbs. and 5'-0" x 7'-0". The number of elevators is based on the number of spaces, the number of levels, user group(s) served, peak-hour flow rates, and the size and capacity of the elevator. A parking consultant can provide a preliminary indication of the number of elevators based on a formula that takes into account the information presented above. *We highly recommend that elevators have glass backs for security reasons. Enclosed lobbies are recommended for protection from the elements on the top level.*

Accessible Parking Requirements

The following table presents the required number of accessible parking spaces based on the total number of spaces provided in any given facility.

The accessible parking requirement for an institution like a hospital campus is not based on the total parking capacity but rather on the capacities of the individual facilities within a parking system, which always results in the provision of more accessible spaces overall. Accessible spaces for the institution do not have to be provided in each parking area, but can be supplied at a different location provided at least equivalent accessibility in terms of distance, cost, and convenience is provided.

All accessible spaces are 8' wide with either a 5' or 8' access aisle. An accessible space and access aisle cannot be placed at a location with a running or cross slope greater than 1:50 (2%).

Required Accessible Spaces	
Total Spaces in Facility	Minimum Accessible Spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1,000	2% of total
1,001 and over	20 plus 1 for each 100 over 1,000

The current 1 to 8 ratio for the provision of van accessible spaces is changing to 1 to 6, and it is required to round up to the nearest whole number when determining the number of van spaces. The barrier free section of the International Building Code (IBC) has the same requirement. It is recommended to use the new 1 to 6 ratio when determining the number of van spaces. Van accessible spaces require minimum 8'-2" vertical clearance and have 8'-0" wide access aisles.

Each accessible space must have a sign showing the international symbol of accessibility mounted at least five feet above the pavement. All van accessible spaces must have an additional "Van Accessible" sign mounted below the symbol of accessibility (mount minimum of 5' above pavement with other sign above).

ADA requires rounding up to the next whole number when calculating the required number of spaces based on a percentage or ratio. For example, a parking facility with 810 spaces will have 17 accessible spaces ($810 \times .02 = 16.2 = 17$ spaces), and 3 spaces will have to be van accessible ($17 \div 6 = 2.833 = 3$).

Accessible stalls cannot share access aisles when the parking is angled. Access aisles for van spaces must be on the passenger side when the parking is angled because vehicles cannot back into these spaces.

All accessible spaces must have an accessible route to public streets or sidewalks, accessible elevators, or accessible building entrances. An accessible route must have a minimum unobstructed width of 3'. A vehicle way (drive aisle) may be part of an accessible route, although it is preferred to place the accessible route at the front of the stalls. An accessible route can only pass behind other accessible spaces. It is permitted to cross a vehicle way with an accessible route. Automatic or push button door opening devices will be needed if the accessible path includes doors that patrons will need to enter/exit.

The running slope along an accessible route cannot exceed 1:20 (5%) and the cross slope cannot exceed 1:50 (2%).

It is recommended to cross hatch all access aisles and accessible routes.

Ultimately, accessible parking must be provided as required by existing city building and zoning codes. However, it is recommended that the standard ADA requirements detailed in this section be used if they exceed existing city requirements.

Safety and Security

Because curbs can be a potential tripping hazard, curbs in all pedestrian areas (at the end of parking rows, around stairs and elevators, dead corners, etc.) are strongly discouraged. The faces and edge of curbs that remain should be painted traffic yellow to enhance visibility.

Glass-backed elevators and glass enclosed and/or open stairways, visible to the adjacent street, are highly recommended for enhanced security. Security fencing should be installed below stairwells to eliminate the possibility of a person hiding under the stairs.

Lighting that enables users to see and be seen is one of the most important security features of a parking structure. A separate discussion on lighting is included in these guidelines.

Other important aspects of security design:

- Short span construction is not recommended. In short span construction, the columns are placed more closely together; thereby adding additional obstructions to lines of sight.
- Security fencing at the ground level should not be climbable. Security fencing ensures pedestrians enter/exit the facility only at designated pedestrian points.
- Landscaping should not provide hiding places.
- Security cameras are a deterrent to criminal activity.
- Panic alarms and two-way communication systems are recommended in prominent locations on each level.

In general, assure that as much openness as possible is provided in the design to improve sight lines, eliminate hiding places, and enhance perceived security.

Lighting

- Key Security Measure
- Enhances User Comfort & Perception of Safety
- Business Attraction Amenity
- Permit Safe Movement for Pedestrians and Vehicles
- Enhances Signage Visibility
- Typically Light Levels Are Not Code Regulated
 - Except Emergency Lighting @ 1 footcandle Minimum
- Industry Standards
 - Illuminating Engineering Society of North America (IESNA)
 - They Publish Minimum Standards
 - Liability Risk for Non-Compliance

The recommended lighting standards listed in the table to the right, slightly exceed the Illuminating Engineering Society of North America (IES) lighting standards for parking facilities. Staining the ceilings white to enhance light levels is suggested.



Recommended Parking Structure Lighting Standards			
Areas	Minimum Horizontal Illuminance on Floor Footcandles	Minimum Vertical Illuminance at 5 feet Footcandles	Maximum to Minimum Uniformity Ratio
General Parking & Pedestrian	2	1	10:1
Ramps and Corners			
Days	2	1	10:1
Nights	1	0.5	10:1
Entrance Areas			
Days	50	25	10:1
Nights	1	0.5	10:1
Stairways	7 avg.		10:1

Signage and Wayfinding

Parking facilities can be very large, complex, and confusing. A well-designed graphics and signage system will effectively communicate necessary information to patrons, reduce confusion, improve safety, and enhance the overall user experience.

Sign messages should be simple and succinct. Messages on signs that are to be read quickly, such as vehicular signs, should be no more than 30 characters and six words in length. The typeface used should be simple and easy to read, and there is a general preference for Helvetica medium in the parking industry. Signs with lower case letters and initial caps are most easily read. The simple block arrow is recommended for parking signs. If a left turn is required, the arrow should be placed on the left side of the sign. The opposite is true for a right turn.

In parking structures, signs with a dark background and white letters are more easily read than signs with a white background and dark letters. The opposite is true in surface lots, where signs with white background and dark letters are better.

Vehicle Signs

Examples of vehicular signs include “Park” and “Exit” directional signs. Vehicular signs are ten or twelve inches in height with six or seven inch letters. Ten-inch signs are recommended for precast structures where sign visibility can be a problem. Vehicular signs should be centered over the drive lane or centered over the drive aisle when signs are mounted back-to-back.

Pedestrian Signs

Examples of pedestrian signs include “Level #,” “Remember Level #,” “Row #,” and “Stair” and “Elevator” identification and directional signs. Pedestrian signs can be all one color or be color-coded by level. Pedestrian signs should be clearly distinguishable from vehicle signs so as not to interfere with vehicular traffic. Pedestrian signs in parking bays are most effective if located perpendicular to traffic flow, and they should be placed at the rear of parking stalls. Color-coding is often used to help patrons find their vehicles. It is not necessary to provide color-coding in parking facilities that are three levels or less. When color coding, it is recommended to use primary and secondary colors including red, blue, yellow, orange, purple, and green. If there are more than six levels that need to be color-coded, it is recommended to use white, brown, and black. Confusing colors such as turquoise (blue or green?) and taupe (brown, tan, or gray?) should be avoided.

The elevator core area provides an excellent location to utilize super graphics. Super graphics is defined as a graphic that covers a large area and is generally painted on a vertical surface, such as painted walls or elevator doors, with level designation incorporated.

Once colors have been determined, the color coding must appear on each parking floor (e.g., on columns and walls) and adjacent to elevator lobbies and stairwells – as well as inside elevators.

Level Theming

“Level Identification Theming” and other wayfinding aids provides an opportunity to enhance parking interior environment enhancement while also providing a practical tools to assist patrons in remembering where they parked. Several creative examples or illustrated below.

Entry Signs

Emphasizing the entrance to a parking facility is important. Large illuminated signs are often used to emphasize the facility entry and attract patrons. These signs often spell out “Parking” or use the International symbol for parking. Architectural features, such as an arch, canopy, or some different treatment of the façade, are often used to highlight the entry area as well. A height clearance bar is required for all parking structures, including the top (surface) level of below-grade facilities to prohibit over-height vehicles. Generally, the height clearance bar is located at the facility entrance(s). There may be instances when the clear height in a parking structure changes



from one level to another (for example, a higher ground level than typical level to accommodate ADA vans), which may require additional height clearance bars within the facility itself. Generally, the height clearance bar is an eight-inch PVC pipe.

Regulatory Signs

Regulatory signs are often used in parking facilities. Examples include “STOP,” “YIELD,” “ONE WAY,” “NO PARKING” “DO NOT ENTER,” and accessible parking signs. When used it is imperative that they comply with local and federal requirements. The Manual of Uniform Traffic Control Devices (MUTCD) provides examples of standard highway signs.

Illuminated Signs

Illuminated signs are becoming more and more common in parking facilities. Technology has advanced significantly in recent years and illuminated signs have become more reliable. Generally, illuminated signs are used for the following parking applications:

- Entry and Exit Lanes (Open in green/Closed in red)
- Facility Full Signs
- Stop (red)/Go (green)
- Level Space Capacity
- Directional Control
- Fee Display
- Space Count Systems
- Variable Message Signs

Pavement Markings

Pavement markings should conform to Manual of Uniform Traffic Control Devices (MUTCD) or local standards. MUTCD specifies that white paint be used for markings for traffic flow in the same direction and yellow paint used for traffic flow in opposite directions, which implies a warning.

Pavement markings can be an effective way to direct and control traffic flow in a parking facility. However, pavement markings must be re-applied due to wear and deterioration from vehicular traffic. Pavement arrows may enhance traffic flow. They are often utilized on surface lots or the top level of parking structures where overhead directional signage is not possible. Traffic arrows are also commonly used in facilities with a combination of one-way and two-way traffic flow.

Drainage

Proper floor drainage is essential for all types of parking structures in all climates. While direct rain or snow may not enter all areas of the parking garage, windblown rain and snow and/or vehicles carrying ice, snow and water will distribute water throughout the facility. Heavy rains will also overload top floor drains and water will run down the ramped floors to lower levels. In addition, the frequent floor wash-downs (e.g., washing the parking surfaces/floors) that should

be part of a good maintenance program are a source of water throughout the parking facility. If the floor is not adequately sloped, water is allowed to pond and deterioration will accelerate beneath the ponds.

A design slope of 2%, or $\frac{1}{4}$ inch per foot, is desired, with a minimum design slope of 1- $\frac{1}{2}$ %. Water should be drained away from exterior columns/walls and pedestrian paths. Washes may be needed in slab corners to achieve drainage slopes.

Floor drain locations are determined by the circulation system, number of bays, and structural system. The top level drain system should be designed to accept a 10-year design rainfall or as required by local code. Three to four inch piping is generally used on covered levels.

Open or Enclosed Parking Structure

Natural ventilation requires openings in exterior walls of sufficient size distributed in such a way that fresh air will enter the facility to disperse and displace contaminated air. The 2003 and 2006 International Building Code (IBC) states:

“For natural ventilation purposes, the exterior side of the structure shall have uniformly distributed openings on two or more sides. The area of such openings in exterior walls on a tier must be at least 20 percent of the total perimeter wall area of each tier. The aggregate length of the openings considered to be providing natural ventilation shall constitute a minimum of 40 percent of the perimeter of the tier. Interior walls shall be at least 20 percent open with uniformly distributed openings.”

“Exception: Openings are not required to be distributed over 40 percent of the building perimeter where the required openings are uniformly distributed over two opposing sides of the building.”

Setbacks can affect openness as firewalls are required if certain distance requirements from property lines and other buildings are not maintained. Parking structures are typically classified as enclosed if other uses (retail, office, residential) are located above the parking, but may remain open if parking is above or adjacent other uses. When a parking structure is positioned below grade, areaways can be used to achieve natural ventilation. The building code addresses the geometry required to permit acceptance of an areaway.

Parking structures classified as “open” do not require mechanical ventilation, fire suppression (sprinklers), and enclosed stairs.

Structural Systems

Following are the advantages and disadvantages of the three primary structural systems commonly used in parking structures today:

- Cast-in-Place Concrete
- Precast Concrete
- Steel Framed

The selection of the structural system should be given careful consideration. The decision is often made based on the following:

- Owner preference
- Design team preference
- Development Review Agency (or Agencies) input
- Schedule
- Construction budget
- Openness and perceived headroom
- Owner's tolerance and budget for maintenance
- Local availability of product and labor

Advantages of Cast-in-Place Construction:

- Monolithic construction so fewer sealant joints
- Positive drainage is easier to achieve
- Post-Tensioning forces reduces slab cracking
- Floor vibration imperceptible
- Flexible column spacing (20' to 27')
- Generally no shear walls
- Lower maintenance cost
- Wide beam spacing creates more open feeling with perception of higher ceiling
- Accommodates parking structures on irregular sites, beneath buildings, and underground



Disadvantages of Cast-in-Place Construction:

- Potentially higher construction cost
- Quality control is more difficult to attain due to exposed weather conditions
- May require architectural cladding to improve exterior aesthetics
- Less adaptable to winter construction in cold climates
- Longer on-site construction schedule
- Closer expansion joint spacing
- Congestion of tendons and rebar at beam column joints
- Larger on-site staging requirement

Advantages of Pre-Cast Construction:

- Quality control because members are fabricated at a plant
- Potentially lower construction cost in some regions
- Shorter on-site construction schedule
- Greater expansion joint spacing (up to 300 feet)
- More adaptable to winter construction
- Architectural façade spandrels also serve as structural load bearing elements



elements

Disadvantages of Pre-Cast Construction:

- More propensity for leaking at the joints
- Higher maintenance cost for sealants
- The close spacing of the tee stems creates the perception of lower ceiling height
- Tee stems can block signage and interfere with lighting distribution
- Shear walls affect architecture at the exterior and reduce visibility at the interior
- Reduced drainage slopes
- More bird roosting ledges?
- Might not be performed by local subcontractors

Advantages of Steel Construction:

- Flexible column spacing of 18' to 22'
- Generally no shear walls
- Can be performed by local subcontractors
- Shorter on-site construction schedule
- Potentially lower construction cost
- Easily accommodates vertical expansion



Disadvantages of Steel Construction:

- Erection concerns due to mixing foundation, steel, and precast subcontractors
- Not recommended where the steel is required to be fire rated by the building code
- Depending upon code requirements, steel structure may need to be fireproofed
- Steel painting for corrosion protection
- Maintenance of steel paint system
- Steel delivery times can fluctuate
- Extensive bird roosting ledges on the beam flanges

Durability Design

It is recommended to perform an analysis in the schematic design phase to determine which durability elements should be included in the design of a parking structure. These elements include sealers, deck coatings, concrete additives, corrosion inhibitors, and epoxy coated reinforcement. Durable parking structures also require quality concrete (low water-to-cement ratio), adequate concrete cover, proper concrete curing, and good drainage. Tradeoffs between initial costs and long-term maintenance costs should be considered. Enhanced durability systems should be provided in areas with severe exposure, such as supported structure near vehicular entries and snow storage areas on the roof level. Deck coatings (membrane) are recommended over occupied space and over electrical and storage rooms.

The design of a parking structure should at a minimum conform to the intent of American Concrete Institute's Guide for the Design of Durable Parking Structures (ACI 362). The design life of a parking structure should be 60 years.

Incorporating Other Land Uses

Many cities today are encouraging or requiring the design of parking structures that enhance the urban environment. Design Guidelines have been established that require parking structures to have level façades on the street sides (no exposed ramps) and pedestrian-active uses on the ground level. Even if not required by local code, there has definitely been a trend away in recent years from stand-alone, single-purpose parking structures. The development of ground-floor retail space in parking structures is often encouraged as even second-rate retail space will typically generate more income per square foot than a good parking space. This is an important consideration as most new parking structures are not self-supporting. When selecting a site for the development of a parking structure, the site that offers the best possibility for ground-floor retail space should be an important consideration.

- New parking structures should incorporate other land uses (e.g., first level commercial space or commercial/residential space wrapping one or more sides) whenever physically/financially possible.
- First level commercial space will increase first level floor-to-floor heights and may necessitate adjustments to the structure's ramping scheme (e.g., inclusion of non-parkable speed ramps).
- Designs should minimize the impact of commercial space on the first level circulation system.
- Designs may need to consider loading dock space and garbage space in the parking structure.
- Restaurant space will need adequate ventilation, which may impact parking efficiency on the levels above the space.
- Entry/exit locations should be adequately positioned to account for adjacent traffic patterns and roadway conditions. Entry/exits should provide for easy identification and access from adjacent streets.
- Parking demand for the integrated commercial/residential land uses should be included in the parking supply and demand analysis for the structure.
- If there is no current market for additional commercial space, the parking facility could be designed to accommodate additional land uses in the future when market conditions warrant.

RECOMMENDED PARKING GARAGE MAINTENANCE PROCEDURES

The following is listing of parking garage maintenance procedures for the Town of Mammoth Lakes to consider as it begins to contemplate investments if structured parking options as parking the implementation phase of Main Street Plan.

The recommended maintenance procedures listed in this section are based on direct Kimley-Horn staff experience and recommendations generated for the National Parking Association (NPA) Parking Garage Maintenance Manual by Parking Consultant Council members, which includes several KHA consultant staff.

1.01. Cleaning

Maintaining a clean facility is important because it affects the overall appearance of the structure, promotes a good reputation and increases the user's perception of safety. Likewise, poor housekeeping invites disregard for proper waste disposal and may indicate an increased tolerance for vandalism or abuse of the facility. It is our experience that the increased user satisfaction and facility reputation often offset the costs of keeping the facility clean. Generally, the membrane waterproofing, sealant, and expansion joint warranties require that the structure be maintained in a clean, safe and serviceable condition. As a result, we recommend that the maintenance program should include the following housekeeping and preventative maintenance items

Housekeeping Items:

- 1) Sweep weekly all parking floor areas
 - One of the most frequently overlooked aspects of parking garage maintenance is proper floor cleaning. If not removed, debris will eventually end up in the floor drains and drain lines and cause slow or blocked drainage.
 - Sweeping can be done either with hand brooms or sweeping machines designed for parking garage floor slabs. All sweeping equipment must first be reviewed "in action" to identify any sharp or rigid components which might contact the traffic bearing membrane or expansion joints and cause damage. Sweeping machines should also be reviewed for weight to be sure that it is less than the design live loads. Sweeping machines should be checked regularly to confirm that they are not causing damage.
- 2) Sweep or mop elevator lobbies, attendant booths, entrance and exit lanes, and elevators daily. Stairs should be cleaned daily and more frequently if they are heavily used.
 - Stair and elevator lobbies are highly visible areas and will experience high volumes of patron foot traffic. These areas should be maintained in a clean and safe condition at all times.

- 3) Periodically sweep or wash out expansion joints and joint sealants.
 - Debris and dirt accumulation within expansion joint and/or joint sealant recesses can hasten deterioration of the joint systems.
 - Stones, glass, and miscellaneous debris trapped against the expansion joint or joint sealant may puncture the gland/sealant during repeated pounding from tires and the continued expansion and contraction of the gland with seasonal structural movement.
- 4) Windows in attendant booths should be washed daily. Other windows in the stairways, elevator cabs, and elevator shafts should be cleaned once a month to once a quarter, depending on their conditions and accessibility.
- 5) Stair enclosures, doors, and frames should be cleaned monthly. The elevator floors and walls should be cleaned monthly.
- 6) Trash receptacles should be emptied daily:
 - Clearly marked trash receptacles should be placed at areas of pedestrian traffic flow such as the stair and elevator lobbies, etc. The absence of trash receptacles, or poor maintenance and collection of trash will tend to encourage littering.
- 7) Floor drains should be cleaned out weekly.
 - Debris can buildup in floor drains and drainpipes causing slow or blocked drainage. Ponding water, which will occur with blocked drains, creates a slip hazard and can affect the durability of the concrete.
- 8) Grease and oil spots that build up in parking stalls, drive lanes and entry/exit locations should be cleaned at least twice a year. Large spots should be cleaned immediately and other spots should be cleaned as soon as significant “build up” occurs.
- 9) Signs should be cleaned with a mild detergent semi-annually to maintain appearance and visibility of the signs.
- 10) Parking control equipment should be cleaned weekly.

Preventative Maintenance Items:

- 1) Semi-annual wash down of the floor slabs and lower vertical surfaces of walls and columns with high volume low-pressure water source such as a fire hose.
 - Preceded by sweeping, a wash down of the garage will help clean the deck of debris.
 - Before and after washing floors, all drains should be checked to see that they are functioning properly. Sand washed off floors can clog drains. Temporary burlap filters may be used to prevent sand from entering drains, but must be removed immediately after washing.
 - A high-pressure, low volume water source (maximum 2,500 psi) may be used to remove spots the fire hose was unable to clean. This high-pressure method should first be reviewed to confirm that the high-pressure water would not cause damage to the traffic bearing membrane, stripes, sealants, expansion joints, or concrete, etc.
 - After several months of vehicular traffic, the traffic striping will become less visible due to an accumulation of dirt and debris. Cleaning during the wash down should help to “brighten” the striping.
- 2) More frequent (monthly) washing should be considered at high traffic areas and at any areas where slower drainage is observed.
 - During winter months washing can be performed whenever moderate temperatures occur.
- 3) The underside of each level should be reviewed during each wash down to identify any leaking through the slab system.
 - Leak locations should be identified on plans and sealants repaired as necessary as soon as possible.

1.02. Doors and Hardware

- 1) **Lubricate all doors.** Lubrication of doors and related hardware should be performed according to manufacturer's recommendations or at least semi-annually.

Frequency: 6 months

Procedure: According to Manufacturer’s recommendations

Supplies: Lubricant and rags

- 2) **Check operation of all doors.** All door hardware should be reviewed to assure proper operation. When a malfunction is noted, it should be corrected immediately to maintain the safety and security of the garage.

Frequency: 6 months

Procedure: According to Manufacturer's recommendations

Supplies: Flashlight

- 3) **Checks doors for signs of corrosion.** Proper cleaning and painting of the doors is important to maintain an attractive entrance to the facility. Inspections should be scheduled to review all doors and hardware for signs of corrosion and damage.

Other preventative maintenance includes painting, which is addressed in Section 1.06.

Frequency: 6 months

Procedure: According to Manufacturer's recommendations

Supplies: Flashlight, wire brushes, rags, and paint supplies

1.03 Electrical Systems

- 1) **Inspect lights for proper operation.** A properly illuminated facility promotes safer travel within the facility and provides a more secure feeling among its users. Daily inspection of luminaries (complete lighting unit), lamps, lenses, emergency lights, ballasts, electrical conduit, light fixture attachment to structure, distribution panels, time controls, etc. should be scheduled to ensure adequate illumination within the facility at all times. Defective luminaries should be repaired or replaced immediately. A properly illuminated facility promotes safer travel within the facility and tends to instill a more secure feeling among users.

Frequency: Weekly

Procedure: According to Manufacturer's recommendations

Supplies: Ladder

- 2) **Clean and replace lights.** Uniformity of lighting is a very important safety concern in parking structures. Scheduled cleaning of lights including lenses and replacement of lamps should be set up to maximize the uniformity of the lighting systems. Lamps should be replaced in groups at the end of their average rated life (refer to lamp cut sheets and local lamp supplier for average rated life). Lamp manufacturer studies indicate that energy costs may be reduced if lamps are replaced in groups before they burnout.

Illumination reduction also occurs due to dirt and dust that accumulates both inside and outside of the light fixture. Annual cleaning of light fixtures is recommended in order to maintain adequate luminance. Replacement of the acrylic lenses may be necessary if "yellowing" of the plastic is reducing the light output

Frequency: Every 12 months

Procedure: According to Manufacturer's recommendations for replacement of lamps

Supplies: Tool kit, ladder, lamps, recommended lens cleaner, and rags

- 3) **Inspect electrical conduits and panel boxes.** Electrical conduits and distribution panels should be inspected monthly to determine if they are functioning properly. Any water leaking into the conduit or panel boxes must be noted and remedied promptly. Identify and repair the source of leaking water in such locations as cracks, joints, and floor openings. Weekly re-secure, as necessary, electrical conduit and electrical fixtures for proper mounting. Cleaning and repainting of metal items or replacement and repair to reduce leaking should be performed as needed.

Frequency: Weekly

Procedure: Visually inspect conduits and panel boxes

Supplies: Tool kit, ladder, waterproof sealant, and rags

1.04. Elevators (for Parking Structure #3)

- 1) **Check elevators for proper operation.**

Frequency: Daily

Procedure: Visually inspect conduits and panel boxes

Supplies: Tool kit

- 2) **Perform annual inspection of elevators.** Preventative maintenance and good housekeeping is essential for proper operation of elevators and associated equipment. Additionally, most elevator codes and local building codes require periodic safety and maintenance inspections. Since requirements vary with the type of equipment, we recommend that the University verify local requirements and review the service contract provided with the equipment installation. Specific maintenance requirements for each piece of equipment are described in the operation and warranty manuals provided by the equipment supplier. Copies of these should be kept with this manual for ease of reference.

Frequency: Every 12 months

Procedure: Contact installer & have annual inspection performed

Supplies: None

1.05. HVAC

HVAC systems in the cashier booth (PS-1) should be inspected monthly. Air conditioner filters should be changed monthly.

Specific maintenance requirements for each piece of equipment are described in the operation and warranty manuals provided by the equipment supplier. Copies of these should be kept with this manual for ease of reference.

1.06. Painting

1) Inspect painted surfaces for corrosion damage.

Maintenance of painting systems is necessary to preserve the facility appearance as well as protect the underlying metal from corrosion. Painted elements that are operations or safety related should be inspected monthly. Painted steel requiring maintenance and inspection includes hollow metal doors, mechanical lines, bollards, and miscellaneous metal.

Frequency: Monthly

Procedure: These surfaces should be inspected noting paint chipping and corrosion of the underlying metal. Rusting areas should be properly prepared by removing all rust down to bare, near white metal followed by priming and painting. As a minimum, miscellaneous metals requiring painting or touch-up should be painted using a two-coat alkyd enamel system. Application preparation should include removing all dirt, oil, grease and other foreign matter followed by a prime coat and two coats of alkyd enamel paint (i.e. Glid-Guard Silicone-Alkyd Enamel, by Glidden).

Supplies: Paint, brushes, rollers, paint thinner (cleaner), rags, ladder, and wire brushes,

3) Clean and restripe parking stalls.

In order to avoid confusion for parking facility users, restriping of parking stalls should be initiated when the existing stripes begin to fade and are difficult to see. What appear to be faded stripes may only be stripes covered with an accumulated film of dirt, oil and grease.

Frequency: Every 12 months

Procedure: Therefore, the maintenance staff should first wash down the striped areas using a mild detergent if necessary, prior to considering the repainting of stripes. This may be adequate to sufficiently brighten the existing stripes. When restriping is required, "non-chlorinated rubber" paint should be used.

When painting over existing stripes, the existing paint should be thoroughly cleaned and prepared by removing all de-bonded paint prior to applying new paint. When changing the striping layout the existing stripes should be completely removed. Painting over the existing stripes with

gray paint is not recommended because as the gray paint begins to fade the old strips will become visible and create confusion.

Supplies: Paint (as listed below), brushes, rollers, paint thinner (cleaner), rags, ladder, and wire brushes,

1. "Latex Traffic Paint, " Glidden, Cleveland, OH.
 - a. No. 22685 Yellow
 - b. No. 22683 White
 - c. No. 20090 Blue

2. "Selfast Acrylic Latex Traffic Paint," Baltimore Paint and Chemical Co., Division of the Sherwin-Williams Company, Baltimore, MD.
 - a. No. TM225 Yellow
 - b. No. TM226 White
 - c. No. TM2133 Blue

1.07. Parking Control Equipment

To ensure proper function and minimize equipment down time, inspections and preventative maintenance should be performed on a regular basis. The parking control equipment consists of control software, loop detectors, card readers, mechanical gates, and revenue control equipment. The particulars of the parking control equipment are in the operations manual and maintenance manuals provided by the manufacturer. These operation manuals are provided and should be located near this manual for ease of reference. In addition to any specific recommendation provided by manufacturer, we recommend the following:

Procedure: The control software should be tested every 90 days.

The loop detectors should be tested every 90 days to verify that they are functioning properly.

The card reader optics should be cleaned once a month with a standard bar code cleaning card.

Each gate should be observed on a monthly basis to watch the motion of the gate arms. Any unusual motion should be noted and limit switches adjusted.

Any unusual noises should be noted and the parts lubricated with SAE #10 oil. Belts should be checked for tension and tightened to proper tension. In addition, each gate should have preventive maintenance performed by an authorized equipment supplier every 6 months.

The system computer should be kept dust free and away from excessive heat and cold.

Supplies: Tool kit, rags, oil,

1.08. Plumbing Systems

- 1) **Clean and flush drainage system.** The plumbing system design consists of floor drains, drain risers, and a dry fire protection standpipe. Floor drains and piping should be inspected monthly to assure proper drainage and the rapid disposal of water. Remove sediment from the piping and flush the drain system thoroughly in conjunction with the semi-annual floor slab wash down. During the wash down procedures, it is recommended that temporary filters, such as burlap, be installed over the drains to minimize debris and sediment collection in the drainage system.

Frequency: Floor drains and piping – monthly
Floor slab wash down – every 6 months

Procedure: Floor drains and piping should be inspected monthly to assure proper drainage and the rapid disposal of water. Remove sediment from the piping and flush the drain system thoroughly in conjunction with the semi-annual floor slab wash down. During the wash down procedures, it is recommended that temporary filters, such as burlap, be installed over the drains to minimize debris and sediment collection in the drainage system.

All piping and fittings should be checked for damage, leaks or corrosion. Damaged components should be immediately repaired or replaced upon discovery. Appropriate action should be initiated to correct or minimize any leaking observed. All corrosion damage should be promptly repaired to arrest the process before a larger scale problem develops.

Floor drain grates should be replaced as required to minimize the risk of a pedestrian tripping hazard.

Supplies: Hoses, flashlights, bristle push brooms, and burlap bags

- 2) **Inspect and drain standpipe system.** The dry fire protection standpipe system should be maintained in a condition to function properly at all times. Pipes, sleeves, and pipe hangers must be kept free of corrosion.

Frequency: Monthly

Procedure: Pipes, sleeves, and pipe hangers must be kept free of corrosion. These surfaces should be inspected noting paint chipping and peeling. Areas should be properly prepared by removing loose paint followed by priming and painting. Application preparation should include removing all dirt, oil, grease and other foreign matter.

Supplies: Paint, brushes, rollers, paint thinner (cleaner), rags, ladder, and wire brushes,

1.09. Waterproofing

As indicated in Section 1.01, to maximize the service life of this structure, it is very important to minimize water penetrations into the structure. As a result, the waterproofing components require rigorous monitoring and maintenance. The waterproofing system design consists of traffic bearing membrane (over occupied spaces), penetrating surface sealer, control joint and cove sealants, and expansion joints. These components have a limited life span and will require periodic repair, reapplication and total replacement at the end of their service life. Lack of periodic maintenance may lead to premature deterioration of the concrete and embedded reinforcing steel and will increase future repair and maintenance costs. Water leaking through damaged waterproofing components can also damage vehicle paint finishes, light fixtures and electrical distribution systems, and in general be a nuisance to facility users and maintenance staff.

- 1) **Inspect traffic-bearing membrane (deck coating).** The primary function of this membrane is to prevent water leakage through the concrete in these areas.

Frequency: Monthly

Procedure: Monthly inspection of the traffic bearing membrane should be performed, noting cracks, tears, blistering, debonding, and worn or deteriorated areas. Isolated failures may lead to localized water leaking, increased chloride contamination, and a potential increase in subsequent corrosion induced concrete deterioration. Membrane failures associated with or leading to concrete deterioration should be repaired only after any concrete deterioration or corrosion damage is addressed and repaired. Membrane damage from wear, vandalism, or accidents will generally require only proper recoating. Recoating or reapplication must be performed only by a licensed applicator and the Manufacturer's recommendations for repairs or reapplication must be followed. The traffic bearing waterproofing membrane system is warranted for five years. Damage from vandalism or lack of maintenance will generally not be covered under the warranty. Therefore, it is important to maintain the scheduled cleaning and maintenance program noted in Section 1.01.

It is recommended that all repairs be fully documented and recorded in a maintenance log.

Supplies: None required

- 4) **Test penetrating sealer for effectiveness.** The penetrating sealer has a limited effective life due to traffic wear, sun exposure, and internal concrete reactions. Generally, the sealer manufacturers recommend

reapplication of the sealer every 3 to 7 years, however, we recommend sealer effectiveness testing prior to reapplication to minimize total long-term cost (may be possible to delay reapplication).

Frequency: 3 to 7 years

Procedure: To test for the effectiveness of the penetrating sealer the manufacturer of a testing laboratory should perform the test. If the sealer has lost its effectiveness, a waterproofing contractor should complete another application.

Supplies: None required

- 3) **Inspect and repair joint sealants.** Sealants have been installed at concrete construction joints, and horizontal/vertical concrete interfaces (coves).

Frequency: Monthly and every 6 months during wash downs

Procedure: Monthly inspections of the sealants should be performed to visually determine where and if any sealants have failed. Failed/damaged sealants should be repaired and checked with the deck wash down for leaks. If failed sealants are not repaired, then potentially expensive restoration may be required to preserve structural safety. Thus, if leaking is observed, the source of leaking should be identified and resealed as soon as possible. The contractor must replace all failed joints for a period of five years.

Supplies: None required

- 5) **Inspect and repair expansion joints.**

All expansion joint glands should be inspected monthly for signs of leaking. Failed joint systems and subsequent leaking will cause contamination to the adjacent concrete and underlying cast-in-place members as well as a continuous nuisance to the facility users. Check individual product warranties for limitations. Damage from vandalism or neglect will not be warranted and therefore it is important to adhere to the cleaning and maintenance schedule as described in Section 1.01.

Frequency: Monthly and every 6 months during wash downs

Procedure: Monthly inspections of the expansion joints should be performed to visually determine where and if any expansion joints have failed. Failed/damaged expansion joints should be repaired and checked with the deck wash down for leaks. If failed expansion joints are not repaired, then potentially expensive restoration may be required to preserve structural safety. Thus, if leaking is observed, the source of leaking should be identified and resealed as soon as possible. The contractor must replace all failed joints for a period of five years.

Supplies: None required

1.10. Safety Checks

Safety checks include assuring the proper operation of the lighting and illuminated pedestrian exit signs.

- 1) **Inspect walkways, handrails, stairwells, and walking surfaces for hazards.** Pedestrian walk paths must be maintained to avoid trip hazards such as loose stair nosings, damaged expansion joints, deteriorated concrete surfaces, or debris. Handrails should also be checked to verify rigidity and ability to withstand handrail loading.

Refer to the NPA Maintenance Manual for a discussion on safety checks.

Frequency: Daily

Procedure: Pedestrian walk paths must be maintained to avoid trip hazards such as loose stair nosings, damaged expansion joints, deteriorated concrete surfaces, or debris. Handrails should also be checked to verify rigidity and ability to withstand handrail loading. The loose fittings should be tightened or repaired as necessary. Damaged expansion joints or deteriorated concrete surfaces should be repaired according to the procedures recommended in this section.

Supplies: Tool kit

1.11. Security System

Security adds to the overall user perception of security in a structure and represents an additional liability for the owner if they are not functioning properly. Thus, it is critical that these systems are maintained and monitored during all hours of operation. If this cannot be done, it is our opinion that these systems should be removed from the structure.

The security systems in this structure include:

- Push for assistance intercoms (all structures).
- Security cameras (PS-6)
- Monitors and VCR's located in the security office (PS-6).

By having these systems the user assumes that the systems are operational and that there is someone monitoring their actions 24 hours a day. As a result we recommend that the systems be checked daily as part of a walk-through inspection, but no less often than weekly, to determine if the systems are functioning properly. Equipment should be maintained as described in the literature provided with the equipment.

Frequency: Daily

Procedure: The camera-housing lens should be cleaned off at least once a month to ensure a clear view.

The monitors and other camera control equipment should be kept as dust free as possible.

Each VCR should be sent in once a year for a complete reconditioning.

The tapes used in the VCR's should be rotated daily. New tapes should be purchased quarterly and the old tapes thrown away.

Supplies: Tool kit

1.12. Signs (Graphics)

The signs should be reviewed weekly for damage from corrosion or vandalism. Replacement, if necessary, should be performed immediately to avoid possible traffic flow problems. Also, signs placed on the top levels of the facilities (or in other areas facing the sun) should be inspected for sun damage annually.

Frequency: Weekly

Procedure: Signs should be washed periodically with a mild detergent to maintain appearance and visibility of the signs

Supplies: Tool kit, mild detergent, water, rags, ladder, and hoses

1.13. Structural Systems

Maintenance of the structural system is one of the most important goals of this maintenance manual. Monthly inspections of the slab system and annual inspection of the beams, columns, walls, etc., are important in order to locate, monitor and record cracking and water leakage observed and allow for immediate repairs that will reduce further deterioration. Maintaining the waterproofing system, including sealants, coatings, expansion joints, etc. is crucial for reducing deterioration of the structural system.

1) Perform inspections of slabs, beams, columns, and walls and make necessary repairs.

Frequency: Monthly – slabs
Every 12 months – beams, columns, and walls

Procedure: Inspect slabs, beams, columns, and walls for cracks, spalls and water leakage. Repair deterioration after review and recommendation by qualified concrete restoration engineer.

If, for any reason, concrete repairs are to be made, **PRESTRESSING TENDONS ARE UNDER HIGH TENSILE STRESSES AND MAY RELEASE WITH EXPLOSIVE FORCE DURING CONCRETE REMOVAL.**

Supplies: Tool kit, flashlights, and ladder

NO drilling or installation of powder driven fasteners in beams or tees should be allowed prior to confirming that this operation will not damage the prestressing tendons or components.

1.14. Stair and Elevator Enclosures

The stair enclosures include steel framed stairs and glass curtain wall systems. Semi-annual cleaning of exterior frames and glazing should be performed as needed.

1) **Clean outside of stair and elevator enclosures and inspect for leakage.**

Frequency: Every 6 months

Procedure: Most dirt may be removed with a moderate pressure water rinse and a brush or sponge. A mild detergent may be added to aid in cleaning the frames. Thoroughly rinse after using any detergent. The handrails are painted steel. Refer to Section 7.06 for recommended maintenance of painted surfaces.

Leakage observed at caulked or gasketed glazing joints or at flashing joints should be repaired immediately. Broken panels should be replaced as soon as possible to maintain a safe passageway and minimize potential water damage to the structure or equipment.

Supplies: Tool kit, ladders, mild detergent, sponges, rags, buckets, and hoses

1.15. Masonry

Masonry is a durable construction material that, if properly designed and installed, requires little maintenance. Maintenance that may be required includes cleaning, tuckpointing or preventive measures such as sealing the masonry and/or joints.

- 1) **Clean masonry and inspect masonry for signs of distress and clean.**
Masonry should be inspected every six months for signs of distress such as bowing masonry, corrosion stains through mortar joints, failure of sealants, spalled or cracked masonry or excessive efflorescence. If these conditions are observed, the consultation of a masonry design professional is recommended.

Frequency: Every 6 months

Procedure: **Cleaning**

Cleaning of stains on masonry is only necessary to maintain its original color and beauty. Stains may be due to paint, efflorescence, dirt, smoke, mildew, graffiti, etc. The most common cleaning solutions for masonry are the following:

- Proprietary cleaning solutions - such as “SureKlean” by Prosoco, Inc., Kansas City, KS (913)281-2700 or masonry cleaning products by Diedrich Technologies, Inc., Milwaukee, WI (414)764-0058.
- Detergent Solutions - suggested solution of ½ cup trisodium phosphate and ½ cup laundry detergent in one gallon of clean water.
- Acid Solutions - suggested solution of 10% muriatic acid (9 parts clean water to 1 part acid).

Most masonry stains should be removed with either proprietary cleaning solutions or detergent solutions. These cleaners should be used in strict compliance with manufacturer’s instructions. Acid solutions are not recommended and should only be used for extremely tough stains and on old stained masonry. Acid washing should only be used with a maximum 10% of acid, as overuse of acid will weaken the mortar and discolor masonry units. Acid should never be used on limestone, marble, calcareous sandstone, glazed brick, architectural terra-cotta, polished granite, light colored brick or dark brown or black brick. Caution must be used with acid and proprietary cleaners to prevent damage to adjacent elements, plantings, and injury to personnel.

Methods used for cleaning masonry include bucket and brush hand cleaning and pressurized water (maximum of 700 psi). Sandblasting is not recommended for cleaning any type of masonry as the risk of damaging mortar joints and scarring brick surfaces is too great. When cleaning masonry it is very important to saturate the masonry surface with clean water before and after cleaning. This prevents the cleaning agent from being absorbed into the masonry thus keeping it at the surface where the cleaning is necessary. With all cleaning methods a small trial should be completed to determine the affect on the masonry, i.e. effectiveness, color change etc.

EFFLORESCENCE - One of the most common stains on masonry in new construction is efflorescence. Efflorescence is typically white in color and is a deposit of water-soluble salts on the surface of masonry. Water-soluble salts are brought to the surface of masonry in solutions of water and deposited there by evaporation. The salts come from soluble salts in masonry units, in mortar or from penetration by rain or groundwater. Efflorescence is not at all detrimental to masonry, but only affects the aesthetics of the masonry. Moisture is the vehicle that brings the salts to the surface. In new masonry walls the moisture typically comes from water trapped in the brick materials and in the wall system from original construction. New buildings typically “bloom” with efflorescence for the first one or two years. If efflorescence continues beyond two years there is a

source of moisture that needs to be identified and eliminated. This source of moisture may be through masonry joints, sealant joints, flashings etc.

Efflorescence is a relatively easily stain to remove. Over time rainwater will wash the efflorescence off the wall. Methods of removal include dry brushing or brushing with a stiff brush and clear water. Efflorescence stains that are more difficult can be removed with the use of a detergent solutions or proprietary cleaners as previously described. Efflorescence removal using wet methods should only be completed in warm dry weather since the added moisture will tend to bring more salts out of the wall.

Supplies: Tool kit, ladders, sponges, rags, buckets, cleaning, detergent, or acid solutions, and hoses

- 2) **Inspect and repair deteriorated tuckpointing.** The water penetration of masonry walls is most dependent on the condition of the mortar joints. Over time mortar will degrade due to atmospheric exposure. When mortar can be easily removed with a finger or with light pressure with a car key, tuckpointing of the mortar joints should be completed to maintain a water resistant wall. Excessive water penetration over time will lead to deterioration of the masonry units and corrosion of embedded metal materials.

Frequency: Every 6 months

Procedure: Inspect the mortar joints in the masonry and test the mortar for soundness with a small screwdriver. When soft areas are located, they should be visibly marked. The areas should be repaired by a masonry contractor.

Tuckpointing involves removal of deteriorated mortar to a minimum depth of ½". Repair mortar should match the color and strength of the existing mortar. With soft masonry materials such as soft brick, limestone etc. using a soft tuckpointing mortar is essential. Type N mortar is most commonly used in tuckpointing of masonry walls.

Supplies: Tool kit, keel or marking pens, and ladders

3) **Preventive Maintenance**

It is important to maintain joint sealants at construction joints and perimeters of masonry walls. Water penetration at these locations can lead to the deterioration of masonry materials, increased efflorescence, and the corrosion of steel support angles, masonry ties and supports.

Often it is recommended that masonry walls be sealed with a proprietary silicone, silane or siloxane type sealer to reduce water penetration. However, the sealing of masonry walls should not be completed without the consultation of a masonry professional as sealing masonry can at times cause more harm than good. For example, applying certain sealers to brick masonry that has efflorescence due to trapped moisture can result in the spalling of

the face of the brick units. Crystallization of the salt deposited behind the sealer will result in spalling of the surface of the masonry. There is also a potential for moisture being trapped behind the sealer resulting in freeze/thaw damage to masonry units and mortar.

Numerous proprietary products are available for sealing masonry walls. Two suggested masonry sealers are "Hydrozo Clear Double 7" - water based by Degussa Corporation (Chemrex) (952) 496-6000 and "Aqua-Trete" by Huls America, Inc., (800) 828-0919. A trial area should be complete to determine if the sealer changes the color and appearance of the masonry.

- 4) **Remove graffiti from concrete and masonry surfaces.** Graffiti results from the application of paint, felt tipped marker, crayons, lipstick or other materials. Graffiti should be removed as soon as possible after it is observed.

Frequency: When needed

Procedure: Inspect area where graffiti is observed. If it is on a painted surface, consider mechanical removal, such as sand blasting or grinding and repainting. If it is on a masonry surface the cleaning method may depend on the type of graffiti medium used. Sand blasting, water blasting, and chemical cleaning are available. Sand and water blasting may damage the masonry surface, while chemical cleaners pose environmental problems and may not be effective. Presently there are over 500 products listed that purportedly prevent, discourage, or remove graffiti.

Blasting with baking soda and blasting with dry ice have been found to be effective and pose minimum damage to masonry and the environment.

It may take several attempts with different materials before the graffiti is removed from masonry. Local firms specializing in graffiti removal should be retained for removal.

Supplies: None required.

1.16. RECOMMENDED MAINTENANCE SCHEDULE

This section provides a recommended schedule of cleaning, inspection, and other maintenance activities. In general, the need for repairs will be determined during the inspection or maintenance phase. The following symbols are used to designate scheduled activity:

H Housekeeping - Housekeeping represents that work conducted by in-house staff consisting of basic cleaning, sweeping, wash downs, etc.

I Inspection - Inspections may be performed by properly instructed in-house staff. Periodic inspections are necessary to confirm proper operation of systems or components.

M Maintenance - Maintenance is usually performed by in-house staff, however, it may occasionally require an outside contractor. Maintenance represents tasks necessary to ensure proper operation of systems and components.

See attached recommended maintenance schedules.

- Schedule 1 - Recommended Maintenance Schedule
- Schedule 2 - Maintenance Record Log

The recommended maintenance record form should be utilized by Parking Services maintenance staff or their designee to record periodic inspections, maintenance and repair.

All repairs should be performed on an "as needed" basis.