The Perplexity of Parking Requirements: Standardization versus Customization

Abstract:

To calculate parking requirements, architects and planners typically use generic standards issued or approved by local authorities. In many cases, these calculations are made up depending on observations of peak demand for parking at single-use developments, or copied from a city to another; regardless of the local key determinants of parking requirements. The application of these rigid standards is argued to issue forceful impacts on design and planning; being the agent to cause a surplus of parking spaces, maximize the financial cost and indirectly affect the natural environment and the green infrastructure.

To rationally react to the paradoxical situation when calculating parking requirements, the paper tries to find a balance between ‘standardization’ and ‘customization’. Firstly, the perplexity of parking standards is highlighted via reviewing the parking requirements as stated in four selected US cities and in the Egyptian Code. After that, key determinants of parking demand, that would affect developing parking standards, are identified. Further, innovative alternatives to reduce parking requirements are studied, and guidelines to fulfill the requirements of parking spaces needed for an existing development or building are introduced.

Keywords: Parking Standards, Customization, Guidelines

1- Introduction:

According to the Wikipedia, ‘standardization’ is the process of “developing and agreeing upon technical standards”. A ‘standard’ is a document that “establishes uniform engineering or technical specifications, criteria, methods, processes, or practices”. The aim is to provide generic specifications that help architects and planners with independence of single suppliers, compatibility, interoperability, safety, repeatability, or quality. On the contrary, ‘customization’ or ‘personalization’ is often based on specific, local or user-oriented inputs. The issue is to ensure that users have the ability to modify these specifications according to the local context.

In architecture, efforts to standardize the data, that architects need, in the form of generic specifications; which are by no means static, have been done. The result is thousands of data resources sometimes referred to as ‘building standards’, ‘design reference standards’, ‘building code’, and ‘standards’ for specific utility buildings or facility types. Despite their generalization and rigidity, these standards can be considered the most likely widely used and accepted data resources.

In this paper, the perplexity of parking standards, as a tangible result of the rigid process of developing the needed technical data, is studied; trying to reach a rational compromise and standing in a mediate position between standardization and customization. First, the rational motives behind this research, its aim, objectives, scope, limitations, and the methodology followed to achieve the objectives are
introduced. To become conscious of the perplexity of parking standards, four selected case studies together with the Egyptian Code are analyzed, and notable remarks are made; arguing the proper circumstances to accept such standards. After that, innovative alternatives to keep parking demand at its minimal rates are introduced, and a discussion took place. At last, guidelines to fulfill the parking requirements in an existing development are provided.

1-1 Motivation:

In calculating parking requirements, architects and planners typically use generic standards that deal with individual land-use categories, such as residences, offices, and shopping. In most cases, these calculations are conducted based on observations of peak demand for parking at single-use developments. They are often copied from one authority to another, and so are remarkably consistent across different cities. Simply, generic parking standards have not kept up the complexity of modern mixed-use developments and redevelopment. They do not take into account the local variables that have influential impacts upon parking demand. Further, parking is typically free in most places, and walking, biking and transit are not taken into consideration. It is also assumed that most adults have cars, most employees drive to work, and every party visiting a restaurant arrives by car. Due to the application of these rigid standards, parking is argued to take up more than 50% of the land used in a development, fig. (1) (Parking Spaces /Community Places-Finding the Balance through Smart Growth Solutions, 2006).

A surplus of parking creates ‘dead zones’ of empty parking lots in the middle of what ought to be a bustling commercial district or neighborhood. These dead zones mean less room for, or inside, offices and homes. Requiring more parking than the actual demands adds substantial costs to development (Parking Spaces /Community Places-Finding the Balance through Smart Growth Solutions, 2006). Normally, the financial cost of providing parking is driven by three key factors: the number of required parking spaces, the ‘opportunity cost’ of the land used for parking instead of being used to house higher value activities, and the cost per parking space. Therefore, the cost of parking is argued to dramatically vary considerably depending on the type and location of development (Parking Spaces /Community Places-Finding the Balance through Smart Growth Solutions, 2006).

Fig. (1): Land used for parking spaces
On the other hand, being stuck to parking standards, issued and approved by local authorities, might enforce architects, planners and owners to make decisions and take actions different from those planned to in earlier stages of the design process. In Assiut New City, as an example, the parking requirements stated in the Egyptian Code are dealt with as the only reference to calculate the required parking spaces; without regard for the low car ownership rate in Assiut City comparatively with the national average, the area of the dwelling, the economic taxonomy of the city, and the availability of public transportation. As a result, one parking space has to be provided for each family dwelling unit, despite the fact that the ground floor area comprises for only 50-55% of the land area; i.e. the area left can be partially used for parking. To respond to such a paradoxical requirement, architects normally offer various solutions to the owners including: adding a basement floor to be used for parking, assigning a part of the ground floor to become a parking zone, reduce the number of floors, or reduces the number of dwelling units in the building; i.e. and therefore reduce number of the needed parking spaces. To be granted the building license, the owner has to choose among these solutions. Figure (2) shows the impact of parking requirements on design decisions.

Beside the financial cost and the forceful impact on design decisions, excessive parking lots indirectly affect the natural environment. It is argued that the dark pavement of parking lots is to promote water quality degradation, irritate heat island effects, raise the air temperature, and consume land. Responding to that, environmental protection strategies are worked out and standards for the green elements and planted materials are set to be central to the entire parking specifications; precisely identifying the number of trees or the area of planting per parking space (Hall Country Georgia: Development Standards, 2004; and Windsor's Central Riverfront Implementation Plan, 2000).

In this context, ensuring that parking demand is precisely sized according to development actual needs, instead of to generic standards, can preserve not only the financial cost, but also the ‘green infrastructure’ needed for the environmental balance. (Parking Spaces /Community Places-Finding the Balance through Smart Growth Solutions, 2006).
1-2 Aim and Objectives

To rationally react to the perplexity of parking requirements, the paper aims to find a balance between standardization and customization; taking the local socio-economic context into consideration. To attain the aim, the following objectives are to be accomplished:

- Investigating the perplexity of parking standards;
- Identifying the key determinants of parking demand;
- Exploring innovative alternatives that have the potential to reduce demand;
- Studying the possibility to provide guidelines for calculating the spaces needed for parking.

1-3 Scope and Limitations:

In dealing with the subject area of parking standards, numerous issues appear to announce themselves, including: minimum dimensions for a parking space, amount of parking spaces needed for a development or building, off-street loading requirements, parking service, construction materials, parking maintenance and protection, exterior lighting, standard signs, environmental protection, and landscaping, vegetation and planting requirements. Also, this subject area appears to stand in a middle way between planning and architecture, since parking standards can be applied at widespread scales; from a single building or utility to a district or city center. Further, the issue can be applied to identify parking requirements in existing developments or new ones.

In this paper, the scope or research is limited to studying the amount of parking spaces needed for an existing development; while parking demands in new ones remain the subject of another research work.

1-4 Methods

To achieve the objectives of the research, the paper starts with investigating the perplexity of parking standards via reviewing the parking requirements in four selected US cities as well as the Egyptian Code. After that key determinants of parking demands that would affect developing parking standards are identified. Further, innovative alternatives to reduce parking requirements are studied, and the possibility to provide guidelines to fulfill the requirements of parking spaces needed for a development or building is studied.
2- The Perplexity of Parking Standards:

To become conscious of the perplexity of parking standards, four selected case studies together with the Egyptian code are analyzed. In order not to be influenced by the varying conditions among countries, which would affect the calculation of parking requirements, all the case studies are selected within the US as a leading country in the field. These case studies include: The City of Raytown, Missouri; Hall County, Georgia; Bloomington, Minnesota; and Eagle County, Colorado. Being stuck to the scope and limitations of the research, only the amount of parking spaces needed at the architectural level is studied, Appendix (1). Based on the analysis, the following remarks are made up:

- Each city appears to have its specific parking standards developed by its local authority, despite the fact that all the case studies are located in the same country.
- Parking requirements for a certain utility, development or building type sometimes differ dramatically from a city to another; referring to the varying key determinants that affect developing these requirements.
- For the same utility, development or building type, the amount of parking spaces are calculated in terms either of the Gross Floor Area (GFA) of the building, number of employees\staff persons, or the amount of users\seats\beds\functional units; referring to the disparity between cities when calculating these standards; and therefore the varying results that might come out of the process.
- In some cases, the parking requirements for a specific utility notably differ from a place to another within the city; depending on the density of the district, its accessibility, or the total floor area, while such influential factors are neglected when calculating parking requirements for the same utility in other cases.
- In certain cities, the amount of parking spaces needed for a specific utility is determined by the local authority or the planning commission; e.g. the amount of parking spaces needed for religious buildings in the City of Eagle County, Colorado.

3- Key Determinants of Parking Standards:

In identifying what might have an effect upon determining the parking requirements for a development 12 factors appear to have the outward aspect of influence. As shown in table (1), these factors are categorized into 5 key determinants, including: demographics of household, users and visitors, type and characteristics of development, availability of surrounding parking lots and transportation choices, financial issues, and time.

This package of factors and key determinants seems to make the notion of depending only on the utility type or land use when calculating the parking demand to become academic; diversifying the knowledge base on which the calculation process should stand. More importantly, parking demand might dramatically vary, due to this wide scope of determinants, not only from a city to another within a country, or from a district to another within a city, but also from a utility type to another within the same district, the fact that shows the whole process to become more sophisticated.

<table>
<thead>
<tr>
<th>Key-Determinant</th>
<th>Determinants</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td>Characteristics of household and visitors</td>
<td>People of different ages, social characteristics and economic levels tend to have different car ownership rates.</td>
</tr>
</tbody>
</table>
### Car ownership
The higher car ownership rate the more parking spaces demanded.

### Type and nature of land-use; e.g. length of stay and number of visitors
For example, a sit-down restaurant would require more parking spaces comparatively with a take-out restaurant with the same number of customers per hour.

### Size of establishment
Larger establishments usually have greater parking demand.

### Mixed land-use
Parking requirements may be reduced when more than one use share the same parking facility, if uses have different peak demand times.

### Density of the district
Each time residential density doubles, auto ownership falls by 32-40%.

### Accessibility of the district (auto or non-auto accessibility)
Increased non-auto accessibility; e.g. walking or biking, will typically result in some reduction in parking demand.

### Availability of surrounding parking
In Vancouver as an example, dwelling accessories can use parking lots available on surrounding sites within 45m from the development.

### Availability of transportation choices
Providing adequate transportation options for people decreases parking demand.

### Cost of land
The ‘opportunity cost’ of the land, used for parking instead of being used to house higher value activities, is to affect parking standards.

### Parking pricing
Demand for parking typically decreases with increasing parking price.

### Time factor
Depending on the land use, parking demand at a site varies by time of day, week, and year. This results in daily, weekly, and seasonal parking profiles; and therefore seasonal parking requirements.

**Source:** Based on the literature cited in the reference section, these factors have been derived, analyzed and categorized by the authors.

Aside from key-determinants, the possibility of keeping the parking demand to its minimal rates is to be studied. Via manipulating these determinants and after realizing the nature and magnitude of the effects they might issue, notable achievements can be accomplished. Further, innovative parking alternatives to reduce parking requirements are to be thought about; with regard to the local context and type of development.

**4- Innovative Parking Alternatives:**

In order to reduce parking requirements in a development or building, innovative solutions are explored and analyzed; as they are argued to prove well and help many purposes in many global experiences. The issue is to keep parking demand at its minimal rate, while at the same time provide sufficient parking spaces for the household, users and visitors. These alternatives include, but not limited to, the following:

- **Compact and Mixed Use Developments**

  In conventional low-density, single-use development, large surface parking lots are normally provided; creating places that are not friendly to pedestrians. As a result, people make the rational choice to drive almost everywhere; and longer traveling distances are registered. On the contrary, compact and mixed use developments can reduce the need for parking; preserving green infrastructure, reducing the amount of travelled distances, and creating a balance between parking demand and community goals (Parking Spaces /Community Places-Finding the Balance through Smart Growth Solutions, 2006).
- **Shared Parking**

  Shared parking involves the use of one parking facility by more than one land-use activity. The issue is to take the advantage of different parking demand patterns and peak times for each use. Shared parking implies that parking spaces are not assigned to a particular use or users; instead it is operated as a pooled parking resource. For example, a mall and an office utility can share a parking facility with a capacity less than the total parking spaces when they have two separate parking lots, due to the varying peaks of occupancy rate. This strategy can be adopted at various scales; from the scale of a single building to the ‘macro’ scale of several developments. As argued, bigger benefits can be achieved in macro scale, mixed-use, compact developments, where many uses have different peak demand times. (Review of Zoning By-Law Parking Standards for Office, Retail and Restaurant Uses, 2007)

  In Vancouver, Canada as an example, the Director, in consultation with the City Engineer, is given the authority to identify the permitted reduction in parking requirements depending on the time-varying demand of uses. In Hamilton, Canada, the parking requirements can be reduced up to 20% of the residential or commercial requirements in mixed use developments. In Niagara Falls, Canada, it is permitted that 50% of the parking requirements of a restaurant or bar can be reduced when it is located within a hotel (City of Toronto Parking and Loading Standards Review, 2005). Further, a number of cities and local authorities has in detail identified the permitted reductions in parking requirements, by determining the occupancy rate for each utility. As shown in table (2), a shared parking scheme for Toronto’s Downtown is worked out based on an assessment of typical occupancy rates during different times of the day for each of the activities included in the scheme.

  **Table (2): Typical Parking Occupancy Rates in Toronto’s Downtown**

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Weekday Daytime</th>
<th>Weekday Evening</th>
<th>Weekday Overnight</th>
<th>Weekday Daytime</th>
<th>Weekday Evening</th>
<th>Weekday Overnight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>60%</td>
<td>100%</td>
<td>100%</td>
<td>80%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Office/Industrial</td>
<td>100%</td>
<td>20%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Retail</td>
<td>90%</td>
<td>80%</td>
<td>5%</td>
<td>100%</td>
<td>70%</td>
<td>5%</td>
</tr>
<tr>
<td>Hotel</td>
<td>70%</td>
<td>100%</td>
<td>100%</td>
<td>70%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Restaurant</td>
<td>70%</td>
<td>100%</td>
<td>10%</td>
<td>70%</td>
<td>100%</td>
<td>20%</td>
</tr>
<tr>
<td>Movie Theatre</td>
<td>40%</td>
<td>80%</td>
<td>10%</td>
<td>80%</td>
<td>100%</td>
<td>10%</td>
</tr>
<tr>
<td>Entertainment</td>
<td>40%</td>
<td>100%</td>
<td>10%</td>
<td>80%</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td>Conference/Convention</td>
<td>100%</td>
<td>100%</td>
<td>5%</td>
<td>100%</td>
<td>100%</td>
<td>5%</td>
</tr>
<tr>
<td>Industrial</td>
<td>100%</td>
<td>20%</td>
<td>5%</td>
<td>10%</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Place of worship</td>
<td>10%</td>
<td>5%</td>
<td>5%</td>
<td>100%</td>
<td>50%</td>
<td>5%</td>
</tr>
</tbody>
</table>


- **Off-Site Locations**

  Parking by-laws traditionally requires parking facility to be provided on the same site as the land use activity. However, there may be benefits in allowing parking to be provided on another nearby site, or where a centralized parking facility is more desirable. In such cases, acceptable walking distance is a matter for estimation and assessment. In Vancouver as an example, dwelling accessory uses may be located on another site within 45m. In Calgary, the authority may allow off-site parking within 120m of the land use. In commercial zones in London, the required parking may be supplied within 150m of the main pedestrian access to the building, structure or use;
for which the parking spaces are required. In Kingstone, parking for residential units may be located within not more than 60m from the residential unit (Review of Zoning By-Law Parking Standards for Office, Retail and Restaurant Uses, 2007). In most cases the off-site parking should be located within the same zoning district, and pedestrian connection is to be provided between the parking lot and the use (Land Development Regulations: Parking and Loading Design Standards, 2009).

- **Tandem Parking**

The alternative of tandem parking involves a parking area where one car can park behind another, so that the outside car must be moved before the other can be accessed. Tandem parking spaces can be allowed for single-family, duplex, townhome residential uses, multifamily residential uses, and hotels, fig (3-a) (Land Development Regulations: Parking and Loading Design Standards, 2009)

- **Use of Pedestrians’ and Disabled Areas at Off-Peak Times**

Pedestrians’ areas and walkways can be underutilized at off-peak times. A simple, sensible and popular measure would permit residents to park in designated pedestrians’ areas, for example, at overnight time. Further, disabled areas, in many city centers, are monitored not to be fully used at evening time. As a result, residents could be allowed to use some spaces assigned for the disabled at this time. Sensitive monitoring and continuous provisioning of the scheme are strongly recommended to ensure that the disabled still have adequate access to their parking spaces. To realize the advantages of this alternative, the case of Birmingham city centre would be beneficial, fig. (3-b, 3-c) (Smallbone, 2005).

![Fig. (3): Tandem Parking and the Use of Pedestrians’ and Disabled Areas](image)

- **Re-Designation of On-Street Parking Areas**

According to the alternative, on-street parking areas can be partially re-designated as residential parking areas at off-peak times. This would provide residents with some of the parking spaces they need, while the rest of parking demand can be provided within the development. This reliable solution is argued to be very popular with residents, provided that sensitive monitoring and adequate provisioning are continuously carried out. The issue is to ensure the balance of parking demand between visitors and residents; meeting the parking needs of residents without compromising visitors to meet their own needs. According to Smallbone (2005), there would be two ways to implement this scheme: allowing residents to park in designated areas between certain times, or introducing a charging scheme for overnight parking but provide an exemption for residents.
• **No ‘Re-Parking’ zones**
  
  In core areas of big cities vehicles are permitted to occupy on-street parking spaces for limited time. “Re-Parking” is a term used to describe the act of moving a vehicle to avoid getting a ticket for exceeding the on-street parking time limit. The City of Cambridge, as an example, adopts a by-law, 2-hour, maximum parking duration to stop people from re-parking their vehicles within core areas. The purpose is to ensure that the prime on-street spaces in these zones are used for short-term visits; promoting visitors to use mass transportation choices (Parking - Core Areas, 2010).

• **Parking Pricing and Cash-Out Programs**
  
  The alternative of parking pricing, and using afterwards parking revenues, is argued to kill two birds with one stone; minimizing the parking demand via promoting visitors to exploit cheaper transportation choices, and financing centralized public garages and parking facilities. Further, developers can avoid constructing parking on site by paying the city a fee, and the city in return provides off-site parking that is available for use by the development’s tenants and visitors. These fees can be imposed as a property tax surcharge or at the time of development permitting (Parking Spaces /Community Places-Finding the Balance through Smart Growth Solutions, 2006).

  On the contrary, cash-out programs imply allowing employees to choose a transportation benefit, rather than simply accepting the traditional free parking space. According to such programs, employers offer each employee the choice of a free parking space, or a payment approximately equal to the value of the parking; normally to those who prefer mass transportation choices or who bicycle or walk to work. The issue is to promote employees not to mono-drive to work, and consequently avoid the financial and environmental cost of excessive parking spaces (Parking Spaces /Community Places-Finding the Balance through Smart Growth Solutions, 2006).

• **Integrating Walking, Biking and Mass Transportation**
  
  The concept of integrating walking, biking and mass transportation can be considered a part of the larger strategic vision for the downtown. This concept encourages employees and visitors to park their vehicles in one location, or even leave them at home, and then use another form of transportation to move around the downtown with appropriate pedestrian, transit, parking, and bicycle facilities. The issue is to ensure parking demand at its minimal rates and avoid the financial and environmental cost (Downtown Parking Management Plan, 2007; and Parking Spaces /Community Places-Finding the Balance through Smart Growth Solutions, 2006).

5- **Discussion:**

In analyzing the innovative alternatives stated in the previous section one can make the following arguments:

• These innovative alternatives are no longer hypothetical or conceptual; i.e. they are adopted, tested and provisioned by many cities and local authorities, and detailed schemes, policies and programs have been already worked out and applied.

• These alternatives can play an important role in achieving the demanded balance between parking ‘standardization’ and ‘customization’; via reducing parking demand and avoiding the surplus of parking spaces, without
compromising the users to meet their actual parking needs, while at the same
time being sensitive to the local circumstances of each case study in isolation.

- Impacts of the proposed alternatives are argued to vary in nature and
  magnitude according to the scale of application as well as the local context.
  Therefore, these alternatives are to be sensitively applied and impacts are to
  be continuously monitored and provisioned. Moreover, adopted alternatives
  should be applied case-by-case, and decisions should not be distributed over
  other cases.

- Due to the diversity of alternatives and the actions they involve, a wide range
  of bodies are argued to work together to enable the offered opportunities.
  These bodies include; policy makers, legislators, city official bodies, planners,
  architects, household, employers, employees and visitors. Efforts done by
  these bodies are to be integrated within a well prepared, detailed regulatory
  framework.

- These innovative alternatives appear to meet the core principles of ‘smart
growth’, including: walkable neighborhoods, community and stakeholder
  collaboration, predictable, fair and cost effective development decisions, mix
  land uses, preserved environmental areas, variety of transportation choices,
  directing development towards existing communities, and compact building
  design. In this context, these alternatives would not only imply providing
  parking spaces at minimal rates, but also support meeting the long-term,
  regional considerations of sustainability over a short-term focus.

6- Guidelines to Fulfill Parking Requirements in an Existing Development:

In the light of the reviewed literature and based on an analysis of global
experiences that managed to successfully fulfill parking requirements; especially in
downtown where major challenges related to parking requirements exist, the
following three-step proposal is worked out.

6-1 Step 1: Identification of Real Parking Demand

Due to the perplexity of parking standards and the varying key-determinants of
parking requirements, table (1), existing generic parking standards or building codes
should not be used without provision. Instead, a precise way to calculate the real
demand for parking spaces is to be prompted. According to many global
experiences, parking demand is assessed for each land use through parking surveys
and questionnaires which are to be considered carefully to develop and refine
parking standards. The main purpose of surveys and questionnaires is to precisely
identify the parking requirements for the household, workers, users and visitors. This
technique has been already prompted in many case studies, including: City of
Toronto, Canada (Parking Standards Review, 2007); Beijing, China (Zhang, Shao,
Wu & Li 2005); and Austin, Texas (Downtown Austin Comprehensive Parking Study,
1999). After conducting these surveys and questionnaires, the collected data is
analyzed and illustrated; highlighting the locations of parking surplus and parking
deficiency.

6-2 Step 2: Exploring the Potential of Innovative Alternatives to Reduce
Parking Demand

As argued before, the balance between the ‘standardization’ and ‘customization’ of
parking requirements can be achieved via adopting one or more of the innovative
alternatives that have the potential to reduce parking demand. The concept is to
exploit these alternatives in the light of sensitive analysis of the local context. More
importantly, parking requirements for an existing development should not be fulfilled
in isolation, in order not to miss the advantages of innovative alternatives such as, shared parking and off-site parking locations. The output expected from this step is a number of actions proposed to reduce demand and minimize deficiency.

6-3 Step 3: Assessing Proposals and Assigning Priorities

In this step, the proposed actions are to be tested, refined, classified and assessed. Further, aims are to be finalized and ways of monitoring are to be worked out. The actions expected from this step can be primarily classified into three main categories. The first category contains the actions that aim at raising the capacity of the development of building to minimize deficiency, at architectural level, via providing more parking spaces or minimizing parking demands. In this category, alternatives of shared parking, tandem parking and the use of disabled areas at off-peak times are expected to play an important role. At the planning level, the second category is expected to involve the actions that are taken; exploiting the alternatives of parking at off-site locations, use of pedestrians’ areas at off-peak times and re-designation of on-street parking areas. At last, the third category appears to involve actions that can be taken by official bodies and local authorities; enabling the opportunities offered by the alternatives of integrating walking, biking and mass transportation, parking pricing and the proposal of no ‘Re-parking’ zones.

7- Conclusions

In this paper, an attempt to find a balance between standardizing and customizing parking requirements is made. The issue is to incorporate local determinants of parking standards as an integral part of the process. Further, innovative alternatives are explored to keep the parking demand at its minimal rates, reduce the financial cost, and minimize the environmental footprint of parking lots. At last, a three-step proposal to fulfill parking requirements in an existing development is provided.

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### Appendix 1: Parking Requirements - Selected Cases

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>• 2.3 spaces/dwelling (low – medium density districts)</td>
<td>• 2 spaces/single family dwelling</td>
<td>• 1.8-2.2 spaces/1 bedroom dwelling</td>
<td>• 3 spaces/single family dwelling unit</td>
<td>• 1 space/up to 200m² unit</td>
</tr>
<tr>
<td></td>
<td>• 2 spaces/dwelling (high density districts)</td>
<td>• 1.5 spaces/multi-family apartment (1-2 bedrooms)</td>
<td>• 2.2-2.6 spaces/2 bedroom dwelling</td>
<td>• 2-3 spaces/multi-family apartment (1-2 bedrooms)</td>
<td>• 1.25 spaces/200-250m² unit</td>
</tr>
<tr>
<td></td>
<td>• 2 spaces/multi-family apartment (3 or more bedrooms); or</td>
<td>• 2.6-3.0 spaces/3 bedroom dwelling</td>
<td>• 3.4 spaces/4 bedroom dwelling</td>
<td>• 2 spaces/more than 300m² unit</td>
<td>• 1.5 spaces/250-300m² unit</td>
</tr>
<tr>
<td>Apartment hotels, boarding houses, hotels and motels</td>
<td>• 1.1 space/residence unit +1 space/2 employees + separate spaces for restaurants and assembly spaces</td>
<td>• 1 space/residence unit + 1 space/2 employees at largest shift</td>
<td>• 1.1 space/residence unit (not including Assembly halls)</td>
<td>• 1 space/residence unit</td>
<td>• 0.6 space/room for all activities, if the retail gross area is less than 1000m²; otherwise the parking standards is applied separately.</td>
</tr>
<tr>
<td>Preschools, baby centers or kindergarten</td>
<td>• 1 space/3 persons of the permitted occupancy</td>
<td>• 1 space/10 children + 1 space/employee + 1 space/vehicle used in the operation</td>
<td>• 1.2 spaces/ten participants</td>
<td>determined by the Planning Commission</td>
<td></td>
</tr>
<tr>
<td>Elementary Schools</td>
<td>• 1 space/staff person</td>
<td>• 10 spaces + 1 space/employee</td>
<td>• 1 space/74.32 m² of GFA (not including Assembly halls)</td>
<td>determined by the Planning Commission</td>
<td>0.05 space/student + 0.3 bus seat/student</td>
</tr>
<tr>
<td>Middle schools</td>
<td>• 1 space/staff person</td>
<td>• 40 spaces + 1 space/employee</td>
<td>• 1 space/74.32 m² of GFA (not including Assembly halls)</td>
<td>determined by the Planning Commission</td>
<td>0.05 space/student + 0.3 bus seat/student</td>
</tr>
<tr>
<td>High schools</td>
<td>• 1 space/staff person</td>
<td>• 1 space/employee + 1 space/3 students in grades 10-12</td>
<td>• 1 space/74.32 m² of GFA (not including Assembly halls)</td>
<td>determined by the Planning Commission</td>
<td>0.05 space/student + 0.3 bus seat/student</td>
</tr>
<tr>
<td>Schools of adult education</td>
<td>• 1 space/staff person</td>
<td>• 1 space/13.94m² of GFA + 1 space/3 employees</td>
<td>• 1 space/37.16 m² of GFA (not including Assembly halls)</td>
<td>determined by the Planning Commission</td>
<td>0.2 space/student</td>
</tr>
<tr>
<td>Post-secondary schools</td>
<td>• 1 space/21 employees + 1 space/6 students.</td>
<td>• 1 space/18.58 m² of GFA (not including Assembly halls)</td>
<td>determined by the Planning Commission</td>
<td>0.2 space/student</td>
<td></td>
</tr>
<tr>
<td>Hospitals</td>
<td>• 1 space/3 beds +1 space/staff and visiting doctors</td>
<td>• 2 spaces/bed capacity</td>
<td>• 1 space/27.87m2 of GFA</td>
<td>1.2 space/100m² of GFA</td>
<td></td>
</tr>
<tr>
<td>Medical clinics</td>
<td>• 1 space/18.58m² of GFA</td>
<td>• 1 space/18.58 m² of GFA</td>
<td>• 1 space/27.87m2 of GFA</td>
<td>2 space/100m² of GFA</td>
<td></td>
</tr>
<tr>
<td>Medical labs</td>
<td>• 1 space/18.58m² of GFA</td>
<td>• 1 space/27.87m2 of GFA</td>
<td>• 1 space/27.87m2 of GFA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office Buildings</td>
<td>• 1 space/18.58m² of GFA</td>
<td>• 1 space/23.23m2 of GFA</td>
<td>• 1 space/26.48 m² of GFA</td>
<td>• 1 space/27.87m2 of GFA</td>
<td>1 space/100m² of low capacity office buildings</td>
</tr>
<tr>
<td>Retail and shopping centers</td>
<td>• 1 space/18.58 m² of GFA + 1 space/37.16m2 in excess of 185.8m²; or</td>
<td>• 1 space/23.23m2 of GFA</td>
<td>• 1 space/16.72m2 of GFA (less than 929.03m2)</td>
<td>2 space/100m² of high capacity office buildings</td>
<td>2 space/100m² of high capacity office buildings</td>
</tr>
<tr>
<td></td>
<td>• 1 space/92.9m² of open sales area + 1 space/37.16m2 of indoor sales area + 1 space/employee</td>
<td>• 1 space/23.23m2 of GFA</td>
<td>• 55 spaces + 1 space/20.44 m² of GFA (929.03 - 9197.40m²)</td>
<td>• 3-4 spaces/100m² of GFA</td>
<td></td>
</tr>
<tr>
<td>Restaurants and cafeterias</td>
<td>• 1 space/9.29m² of GFA</td>
<td>• 1 space/9.29m² of GFA</td>
<td>• 460 spaces + 1 space/26.48 m² of GFA (more than 9197.40m²)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly Halls and auditoriums</td>
<td>• 1 space/3 seats; or 1 space/9.29m² of usable floor area; or 1 space/46.45 m² of floor area</td>
<td>• 1 space/3 seats; or 1 space/18.58 of GFA</td>
<td>• 1 space/2.5 seat</td>
<td>• 1 space/9.29m² of floor area used for seating or assembly</td>
<td>0.2 space/seat</td>
</tr>
<tr>
<td>Religious Building</td>
<td>• 1 space/3 seats</td>
<td>• 1 space/3 seats of maximum seating capacity</td>
<td>• 1 space/3 persons</td>
<td>determined by the Planning Commission</td>
<td></td>
</tr>
</tbody>
</table>