



Insight

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Parking Structure Maintenance

PART 1: THE COST OF PARKING



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Most people, including those in the design profession, see the rugged looking nature of a parking structure and assume they are bullet proof and don't require maintenance. Unfortunately, nothing could be further from the truth.

Parking structure maintenance, when performed at the optimum time, can provide a Return on Investment (ROI) that far exceeds that of other maintenance activities. In this two-part article, Part 1 reviews the cost of parking, specifically the cost of different parking types and structures, including a Life Cycle cost comparison. Part 2 will highlight the importance of routine maintenance activities to the Life Cycle Cost of the parking structure.

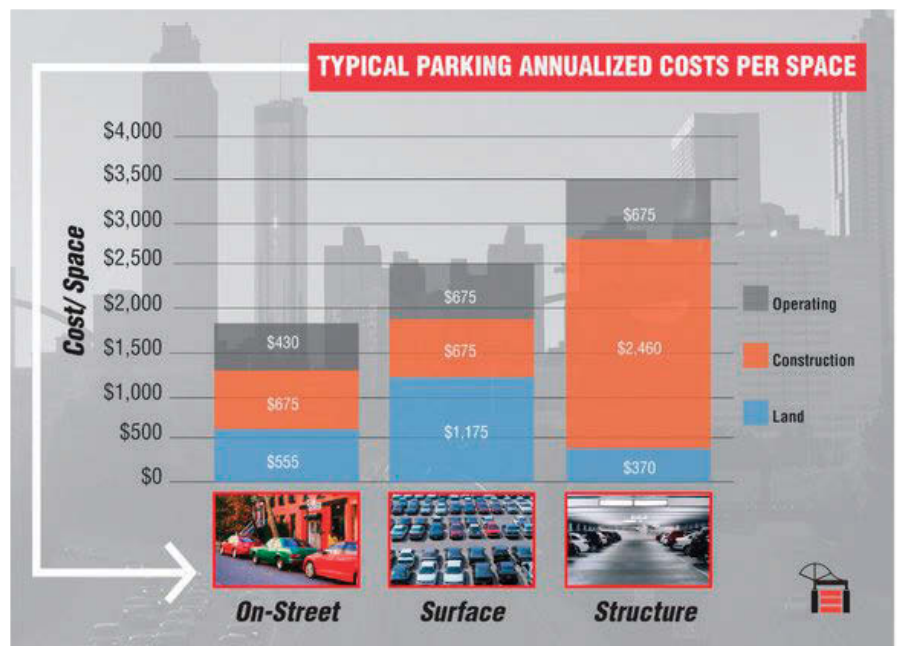
Why Should I Care?

Many people believe that since parking structures appear to be made of durable materials such as concrete and steel, they are indestructible. Unfortunately, this simply isn't the case. Unlike building structures that are protected by building envelopes, such as façades and roofing, parking structures are completely exposed to the elements of wind,

rain (sometimes acid rain), snow, deicing salts, thermal expansion and contraction, ultraviolet light, carbon dioxide, as well as moving dynamic vehicle loads. Like other exposed structures such as bridges, docks and stadiums, deterioration starts even before the structure is

put into service and continues at an accelerated rate.

A parking structure, also referred to as a parking deck, garage or facility, represents a substantial initial investment in land, superstructure and support systems. Proactive



maintenance provides the best ROI, as it keeps maintenance costs low and protects the market value of the facility. Reactive deferred maintenance has little immediate impact, but increases repair costs exponentially over time. Deferred maintenance can also impact the first and last impression of a guest, customer, tenant, or buyer, as well as negatively impact the sale of the facility. Component failures and major repairs due to deferred maintenance can also disrupt the use of the parking structure and lose revenue.

The Cost of Parking

According to international parking consultant Kirk Taylor, AIA, LEED AP with PARC, the least expensive parking space is the one you do not have to build. This of course applies to all types of parking including on-street, surface lots and structured parking. While building owners do not always charge for parking, it is not free. It can represent substantial initial, operating and maintenance costs. Some landlords tend to bundle the cost of parking with rent. However, the modern paradigm is to charge tenants separately for parking. This better earmark of revenue can improve operations, security and maintenance of the structure, as well as encourage alternative modes of transportation such as walking, bicycling, ride sharing and mass transit, which all lead to less traffic and environmental impact. The improved operation can utilize the parking facility more efficiently, thereby minimizing cost while maximizing supply, allowing excess spaces to be rented in a secondary market. A parking consultant can help you plan, design, operate, maintain and pay your facility costs in the most efficient manner. The National Parking Association offers a useful "Guide to Selecting a Parking Consultant."

As can be seen in Figure 1, the cost of structured parking is of course significantly more than the other common forms of parking: on-street and surface lot. Structured parking requires less land per space, but construction cost of the superstructure is significantly more than the cost of pavement, curb and gutter for on-street and surface lots. The costs in Figure 1 from the Victoria Transport Institute have been adjusted for inflation, and show order of magnitude costs

to demonstrate the relative costs of the different types of common parking.

The Cost of Structured Parking – Structural System Selection

The structural system for a new parking structure makes up two-thirds the cost of construction and most of the maintenance budget. Therefore, the selection of the system is an important one. System selection is often influenced by one or more of the following:

- Owner's Preference (e.g., good or bad experiences)
- Initial Cost (e.g., lower initial & higher long-term cost vs. higher initial & lower long-term costs)
- Life Cycle Costs (including initial and maintenance cost)
- Availability of Material (e.g., access to precast concrete and fabricated steel)
- Availability of Labor (e.g., access to specialized Cast-in-Place labor)
- Site Access (e.g., for trucks and cranes)
- Schedule (e.g., impacts from hot summer or cold winter conditions)
- Structure Footprint (e.g., non-rectangular shapes may disfavor precast concrete)
- Architectural Features (e.g., architectural requirements may favor a structure type)

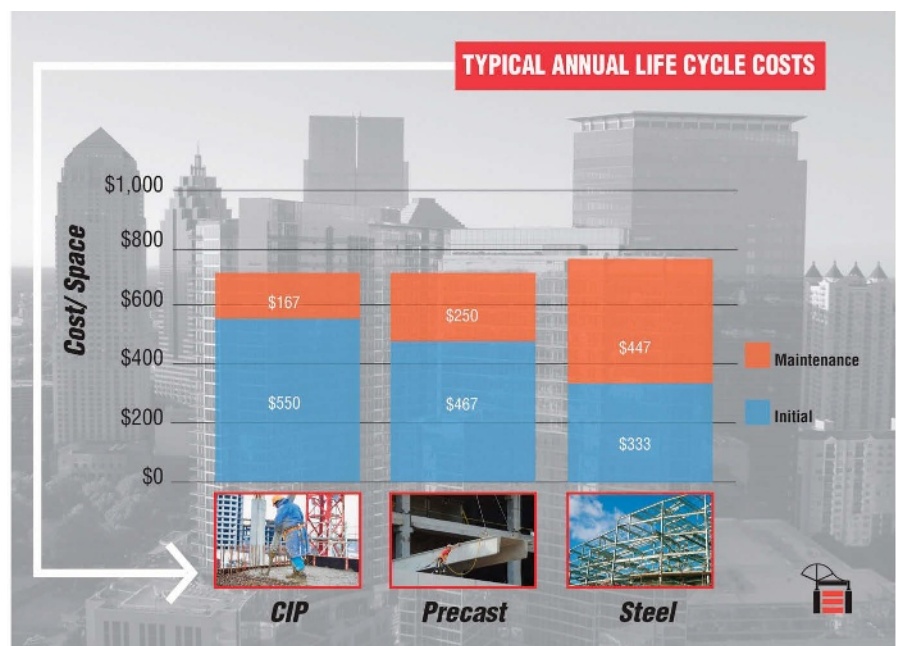
The three most common structural systems of Cast-in-Place Concrete (CIP), Precast Concrete and Structural Steel are shown in Figure 2. There are also hybrid combinations of these three systems. Numerous other structural systems are more prone

to durability problems and rapid deterioration and are therefore not discussed.

Cast-in-Place Concrete (CIP) systems are typically constructed by delivering concrete in ready-mix trucks to the job site, then placed into wood or metal forms containing mild and post-tension reinforcement. CIP parking structures are cast monolithic with fewer joints to leak water and therefore have a longer life expectancy and lower maintenance costs. However, they come at a higher initial cost.

Precast Concrete systems are made up of components cast at a manufacturing plant into forms containing pre-stressed reinforcement and steel embedments to facilitate erection at the site. The members are shipped to the site, erected and welded together. Precast double tees that create the horizontal surface are either provided Pre-Topped, which has thicker flanges incorporating the wearing surface, or Field Topped, which has a wearing surface of reinforced concrete that is applied in the field. Precast parking structures represent a lower initial investment than CIP. However, they have more joints to leak water, exposed steel connections that can rust and inherent flexibility, which allows for thermal expansion and contraction damage. Therefore, precast parking structures are more expensive to maintain than CIP.

Structural Steel systems are made up of shop-fabricated steel members that are shipped to the site, erected and covered with either a reinforced CIP concrete surface on metal deck,



a formed post-tension CIP deck, or precast. Structural steel parking structures have the lowest initial cost but have inherent corrosion issues and are therefore the most expensive to maintain.

The Cost of Structured Parking – Annualized Cost Comparison

Order of magnitude annualized life cycle costs for each of the structural systems are shown in Figure 2. These values provided by parking consultant Kirk Taylor, AIA, LEED

AP include initial investment and scheduled maintenance costs for a 500-space parking facility amortized over a 30-year Highest & Best Use life. Operating costs are assumed to be the same for each of the systems and are not included for clarity. As can be seen from the chart, the CIP system has the highest initial investment but lowest maintenance cost. This makes these systems more appealing to long-term institutional owners. The total life cycle cost of a precast system is similar to that of CIP concrete, but with a lower initial cost and


a higher maintenance cost. By contrast, the structural steel system has the lowest initial cost but the highest maintenance cost, resulting in the highest total life cycle cost. The systems with lower initial cost are appealing to real estate developers seeking a shorter-term capital investment with the intent of resale in the near future.

Conclusion

Parking structures represent a major capital investment. Deferred maintenance can lead to serious structural deficiencies that are very expensive to repair, a shortened life span or both. Given the harsh environment in which parking structures exist and the accelerated rate of deterioration compared to most other buildings, maintenance and repairs done early are less expensive and provide a ROI that far exceeds that of many other maintenance activities. A Parking Structure Restoration Engineer can help you determine the current condition of your parking facility, plan and budget for maintenance and repairs, in addition to providing assistance with how to fund these activities. An ounce of prevention is worth a pound of cure. Call a Parking Structure Restoration Engineer today.

Be sure to read the second part of this two-part article in a future edition of BOMA Georgia's Insight magazine, which reviews how maintenance activities can reduce the life cycle cost of your parking structure.

References:

National Parking Association, Parking Facility Maintenance Manual, Fifth Edition
National Parking Association, Guide to Selecting a Parking Consultant, Copyright 1997, 2013 

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