

Laying the

It's likely that as a driver, there are garages you favor over others and some you completely avoid. This could be due to a variety of reasons, such as the proximity of the parking facility to your destination, the cleanliness of the garage, vehicle volume, congestion in the garage, or maybe your SUV or truck simply just doesn't fit.

By James C. Anderson and John M. Porter

We polled several garage owners and managers to understand the difficulties they face when trying to provide an enjoyable user experience and increase parking demand. We found that while owners and stakeholders are allocating funds to upgrade facilities with the user in mind, at times, parking garage maintenance, repair, and rehabilitation are deferred or neglected. We decided to dig deeper into the issue of deferred maintenance and asked a sampling of facility managers and owners:

- Do you have a current condition assessment?
- Do you have a capital renewal plan?

- What is the biggest challenge to maintain, repair, and rehabilitate your facility?

Based on the responses we received, about 50 percent of respondents have a current assessment and capital renewal plan in place, but 100 percent plan to do it going forward. It is great to hear that everyone is planning for the future, but why isn't it actually happening now? Many of the responses we received simply stated "budget" as a reason. Similarly, when we asked about the most challenging aspect of maintaining facilities, responses also revolved around budget, accompanied by an overwhelming concern about the disturbance repair projects can create and the loss of revenue that accompanies loss of parking during construction projects.

While it's understandable that budgets are often tight, planning for maintenance, repair, and rehabilitation work cannot be indefinitely postponed. A plan eventually needs to be established to provide stakeholders with a fundamental understanding of the asset's value and what steps should be considered to extend its useful life.

Condition Assessment

Parking structures are typically exposed to severe environments and are hybrid in nature. On one hand, parking facilities are analogous to bridges in that they need to accommodate live loads from vehicles, thermal and moisture movements, wind and seismic loads, and exposure to deicing salts in cold climates. On the other hand, they need to comfortably

accommodate users who become pedestrians when using the facility, and they often incorporate tenant space in the facility.

Condition assessments help us determine the overall condition of a garage, identify safety issues, identify potential upgrades, and develop future repair and maintenance costs. This information is an essential benchmark for the facility management and related



(Above) Damage at parking deck slab



Deterioration at tee-to-tee joint

stakeholders to gain an understanding of the asset as it exists today. This assessment will provide the owner with the information necessary for short- and long-term budgeting and planning.

Understanding the condition of a parking structure starts with a brief description and location of the facility, including but not limited to, the age and type of structure, number of parking spaces, entrance and exit portals, stairwells and/or elevators, facade construction, service use, and review of prior engineering assessments, reports, and documents. It is important to identify whether the parking facility has any ancillary



Expansion joint damage and tripping hazard

Groundwork

The right steps to extend the life of your parking facility.

mixed-use or is incorporated with any occupied space. With this overview information as a backdrop, a condition assessment can be undertaken at various levels, from a preliminary walk-through assessment by facility management to a more comprehensive assessment by an engineering professional.

A walk-through assessment should look closely for potential safety issues and hazards; if any are identified, they should be immediately brought to the owner's attention and addressed. Emergency, life-safety, and security systems should also be evaluated for proper operation.

Documenting the condition of structural components is a critical part of an assessment, especially because deferred structural repairs can lead to costly future repairs if not addressed. Special attention should be paid to cracks, delaminated concrete, spalled concrete, corroded structural steel, and other signs of structural deterioration or distress. Moisture penetration and leakage through cracks, cold joints, and expansion joints are often a precursor to premature structural deterioration and should be documented and repaired.

The components that are typically included in an assessment include:

- Safety and security equipment.
- Structural components, including beams, slab, columns, and walls.
- Facade.

- Plumbing.
- Lighting and other electrical systems.
- Mechanical systems.
- Stairs and elevators.
- Roofing.
- Architectural components.
- Floor surfaces, including waterproofing membranes.
- Walkways.
- Site features.
- Cleanliness of facility.

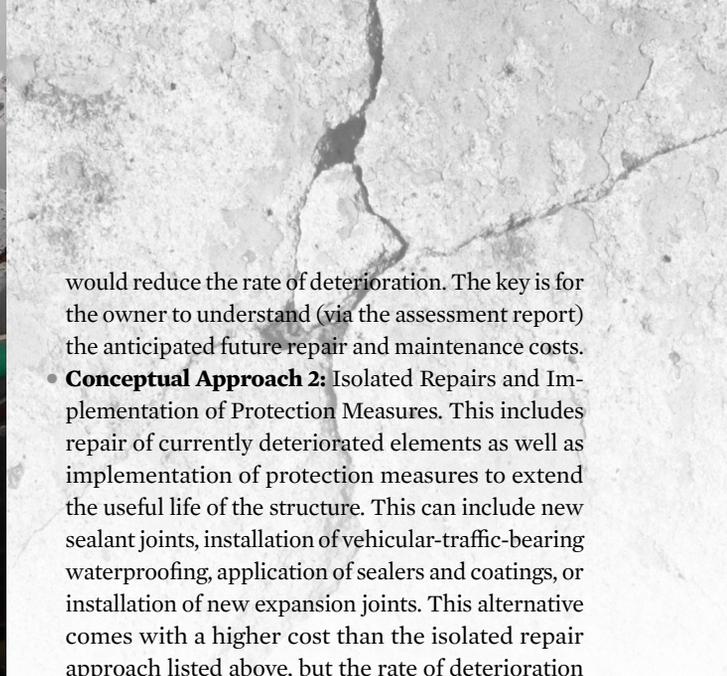
Inspection and maintenance schedules should be determined for the various building components. Also, a detailed condition assessment can be considered to gain a better understanding of the facility's condition. The detailed assessment often includes hands-on inspections, field and laboratory testing, and detailed short- and long-term cost estimates.

Options and Alternatives

Repair and rehabilitation strategies are often presented in the condition assessment report to provide the owner with various options to extend the useful life of the facility; the report identifies the advantages and disadvantages of each alternative and the associated costs to allow the owner to choose the best course of action for their particular needs.

The strategies can have a wide range of options and costs depending on the required useful life of the

Underside slab deterioration



structure. Below is an example of how rehabilitation strategies might be structured in an assessment report. Often, repair of structural components are driving factors in the overall cost of repairs. These conceptual strategies are geared toward structural repair and protection to demonstrate the range of alternatives that are available.

- **Mandatory Repairs.** Mandatory repairs include work identified during an assessment that must be performed immediately. This may include safety items such as severely deteriorated structural components that require immediate shoring, removal of loose or spalled concrete that could be a potential falling hazard, or spalls in the deck that are a tripping hazard.

- **Conceptual Approach 2:** Isolated Repairs and Implementation of Protection Measures. This includes repair of currently deteriorated elements as well as implementation of protection measures to extend the useful life of the structure. This can include new sealant joints, installation of vehicular-traffic-bearing waterproofing, application of sealers and coatings, or installation of new expansion joints. This alternative comes with a higher cost than the isolated repair approach listed above, but the rate of deterioration will be reduced and future repair and maintenance costs will be lower.
- **Conceptual Option 3:** Additional Protection Measures. Other upgrades to extend the life of the structure can include application of penetrating corrosion inhibitors, installation of galvanic anodes, or cathodic protection. These additional measures can significantly reduce the rate of deterioration but also come with wide range of costs, which are often higher than the options listed above. These protection measures often require additional testing and documentation to verify that the systems are performing as designed.
- **Conceptual Option 4:** Demolition and Replacement. The facility may be so severely deteriorated that complete demolition and replacement is the preferred



- **Conceptual Option 1:** Isolated Repairs. The isolated repair approach is geared toward repairing components that are currently damaged or deteriorated. This approach may at times be referred to as the chip-and-patch approach (jackhammering/chipping deteriorated concrete and patching it). The advantage of this option is that it typically has the lowest initial cost. The disadvantage is that the long-term future repair costs will likely be higher when compared to other options. This is a result of only repairing the currently damaged components without implementing other corrosion mitigation techniques that

option. Even if the garage is not at this point, presenting the demolition and replacement cost as part of the assessment report will help the owner understand repair versus replacement costs.

The repair options listed above are intended to give a flavor of how rehabilitation strategies can be developed. In practice, the strategies should be tailored to the specific garage and conditions observed during the conditions assessment. The assessment team and owner should also review short- and long-term budgets, and the rehabilitation strategies can be phased and prioritized to meet the owner's needs.



Beam deterioration

Implementing Repairs

It is important to engage and communicate with all involved parties, from the owner to users to stakeholders to facility staff. Managing expectations during each phase of work allows the parties to understand the challenges, phasing, and duration of the project.

You cannot communicate too much, and this starts during the development of construction documents. During this phase, several questions should be considered by the team:

- How many parking spaces can be given to the contractor during construction? Smaller phases will likely lead to increased costs and a longer schedule but also need to be balanced with parking demands.
- What are the work hours? Off-hour work may lead to increased costs for premium time.
- Is there an opportunity for a full garage shutdown to perform certain phases of the work?
- Are there any noise restrictions in addition to local ordinances?
- Are there dates or times work cannot be performed?
- Is there a specific phasing plan that must be followed or will the contractor be given flexibility?
- Are barricades and full height enclosures required throughout the project? This will likely lead to added costs and an extended schedule.



Corroded plumbing

- Will there be any construction materials that exhibit odors or fumes that may be deemed objectionable to those in the general proximity? This could require modification of HVAC systems at air intake vents, lobbies, and other entrances/exit doors.
- Is there vibration-sensitive equipment in the facility? This could require restrictions on pneumatic demolition equipment or require the use of hydrodemolition to reduce potential vibrations.
- Will liquidated damages be included in the contract? Alternatively, would the contractor receive an acceleration bonus for completing the work early?

When these questions are answered and a rehabilitation strategy is determined the team can develop bid documents that typically include general requirement specifications, technical specifications, and drawings. On private projects, the owner and consultants typically develop a list of qualified bidders that have experience with parking garage repair projects. On public projects, agencies sometimes procure the work with a construction manager to assist with phasing and scheduling during the design process. This approach can also be used in the private sector and allows the team to work through logistical issues as the documents are being developed.

Once the bids are received, the team analyzes the bids to identify line items that have a large variance between bidders. (This could be an indication that the scope was not clear.) To vet the bids, it is often helpful to conduct scope review meetings with the contractor(s). This provides the team with an opportunity to discuss the contractor's understanding and approach to the project. It is also an opportunity to reconcile costs.

Owners and managers made it clear to us that they want to improve the user experience in their facilities. By performing regular condition assessments and updating the capital renewal plan, the useful life of the facility can be extended with short- and long-term goals in mind.

We plan to author future articles to cover the process of developing a condition assessment through completing a construction project. If there are items that you would like us to elaborate on from this article or specific items that you would like covered, please email us directly.



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