

RE T H I

IMMEDIATELY after a parking structure is opened for business, it is subjected to a harsh environment: standing water, salt ingress, freezing and thawing, temperature changes, and leaks, among other things. This environmental attack causes the parking structure to deteriorate, eventually requiring repairs at some point. Typical repairs include concrete demolition and replacement and application of waterproofing coatings.

When repairs are necessary, there is an effect on parking operations and users. Living through a repair program is unpleasant and inconvenient, but not all repair programs are created equal. There are decisions that can be made and approaches that can be used by the owner, consulting engineer, and contractor that can minimize the effects and inconvenience. Sometimes these come with trade-offs or extra cost, but knowing what to expect at the start of the project allows them to be considered and intelligent choices made so the repair program has the maximum chance for success.

The Effects

Different construction activities have different effects on the users of the parking facility:

- **Dust.** Dust is primarily produced by concrete repairs—jackhammering, sawcutting, sandblasting, etc. While contractors will have equipment to protect themselves, the dust has a definite effect on the public. The dust will be visible in the air, affecting visibility for people walking or driving through the area. Those people also do not want

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What to expect when you are restoring structures.

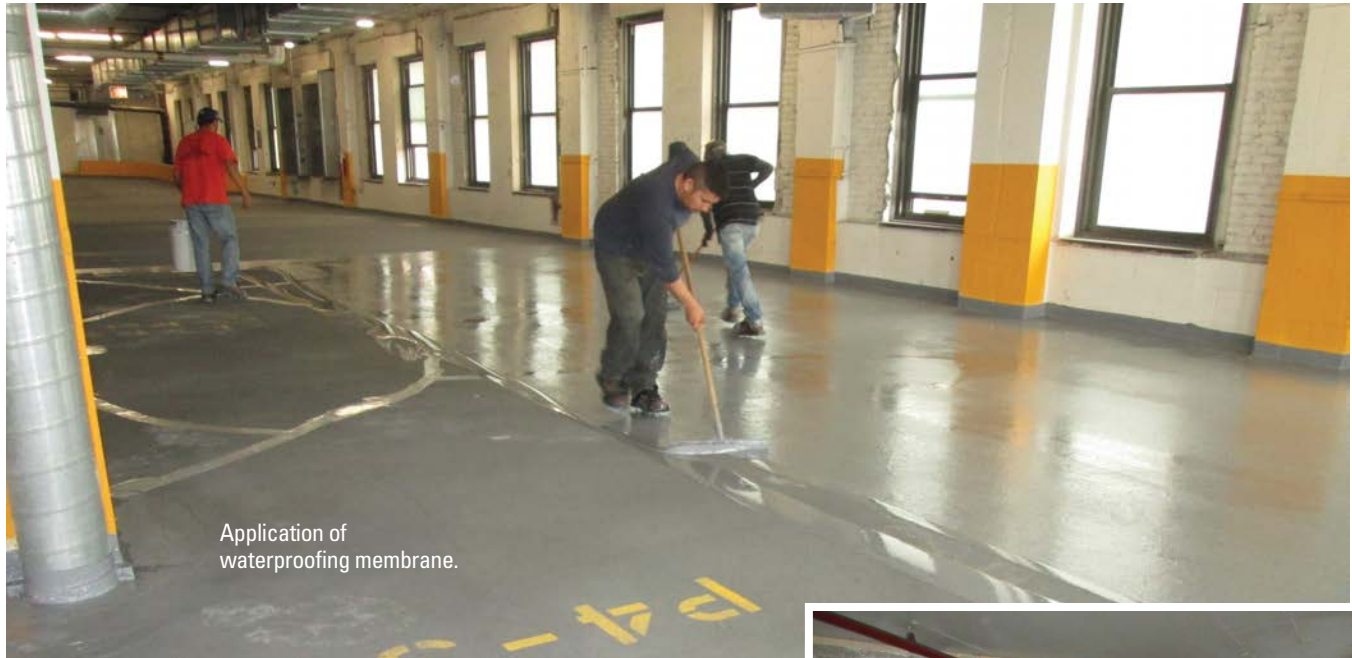


Typical parking structure deterioration.



N K I N G a project





Application of waterproofing membrane.

to inhale the airborne dust. After it has been created, dust can settle on cars and people even outside the work zone. And garage patrons do not want to come to a dirty car at the end of the day.

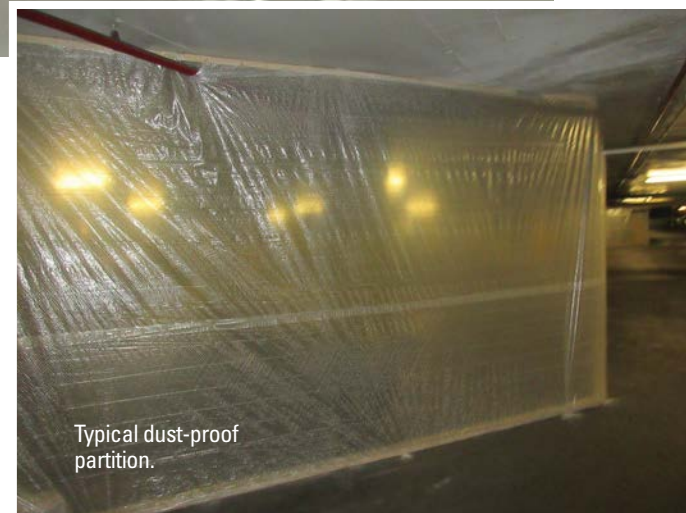
- **Noise.** In addition to being dusty, concrete repair is noisy. The machinery and demolition can be extremely loud. While it is typically not loud enough to cause hearing damage during a short exposure outside the work area, it does create an unpleasant experience. People don't want to enter a loud area to park or pick up their car. One thing that is always surprising is how far through a building the noise travels—it transmits great distances through the concrete structure.
- **Odors.** Unlike dust and noise, odors and fumes are primarily produced by the application of waterproofing systems. There has been a greater awareness of the effects of these products, and volatile organic compound (VOC) limits are becoming more tightly controlled, leading to a reduction in fumes. Different people have different sensitivities to these type of odors; some people will suffer from headaches or nausea while others will be unaffected. One good thing is that the odors typically dissipate quickly and are only present while the waterproofing material is being applied.

Strategies to Mitigate Impacts

There are a number of different strategies that can be used to mitigate the impacts of construction. Different strategies can help with different impacts; some of them are shown in Table 1. These should be considered by the owner, consulting engineer, and contractor when planning the work, as some have cost and schedule considerations.

Partitions

The construction area needs to be separated from the area open to the public for safety reasons—you can't



Typical dust-proof partition.

Table 1. Impacts and Strategies

	DUST	NOISE	ODOR
Partitions	X		
Hydrodemolition	X	X	
Off-Hours Work	X	X	X
Product Selection			X
Ventilation	X		X

have people walking or driving through the work area when construction is going on. A simple barrier such as construction tape or a snow fence is all that is needed to keep the public out and designate work areas.

To mitigate the impact of dust on the public, however, these partitions need to be beefed up. They need to be full height and of a solid material to be dust-proof, although not 100 percent effective. Frequently, visqueen, plastic sheets, or plywood can be used to construct the

dividers, supported at the top and the bottom by the parking structure. On the roof level, it will not be feasible to create a roof to completely enclose the work area, but high dividers can at least keep most of the dust in.

The disadvantage of requiring the contractors to install more substantial partitions is the cost and the effect on schedule. It is more expensive to install this type of partition compared with construction tape or a section of temporary fencing, but this cost is usually small compared to the overall project cost. There is an impact on schedule as well, as it will take the contractors additional time to erect and take down the partitions for each phase of the project when the area of work moves.

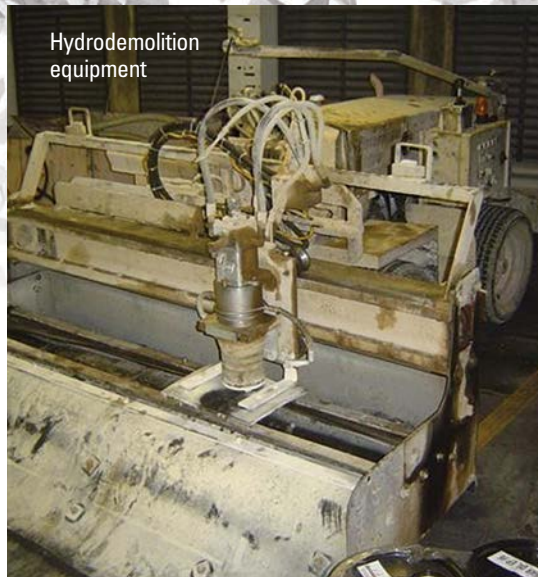
Hydrodemolition

Hydrodemolition is the removal of concrete using high-pressure water rather than chipping hammers. While not quiet, it does have a lower volume than manual demolition, and the noise is more consistent so is frequently considered less annoying. Its big advantage is that it does not produce dust. It does produce water and mud that must be managed so hydrodemolition is feasible if there is a large amount of concrete repair. An area is required to manage the water and allow it to be treated prior to discharge. One limitation is that hydrodemolition cannot be used with post-tensioned concrete structures, not only due to the possibility of tendon breakage but also because the hydrodemolition will strip off the sheathing and water will enter the ducts, leading to future corrosion problems. If you have buried electrical conduit in the slab, there also will likely be some issues.

Working During Off-Hours

Having the contractor work during off-hours is often an attractive arrangement when it is possible. If parkers are not present in your parking structure when the work is going on, they will not be as affected by dust, odors, and noise.

First you need to evaluate the off-hours for your facility. For example, office buildings are primarily busy during the work day but empty at night. However, for residential buildings, the parking is usually busy during the evening and on weekends, so their off-time would be during the day. For a shopping mall, the first part of the week (Monday through Wednesday) and early in the morning is typically less busy than the remainder of the week, and it's prudent to avoid all times between Thanksgiving and Christmas. Some facilities, such as hospitals, do not have an off-time.



Once an off-time has been identified, local ordinances need to be considered. Although you may be happy to have contractors making noise during the evenings, your residential neighbors may not be so happy and there are frequently municipal noise ordinances to keep in mind.

The primary disadvantage of working during off-hours when it is permitted is that there may be a premium for working at this time. If the available number of hours are less than a normal working day, working then also may extend the project schedule. The expectations for off-hour work should be clearly communicated during bidding. It also needs to be remembered that just because the contractor is working off-hours, the area that is being blocked off for the work will frequently need to remain blocked off the entire time, even when work is not being done.

Product Selection

Reducing the effects of odors on the public starts before the start of construction with appropriate product selection. Although there are government limitations on the amount of fumes that can be produced by different product types, these are maximums. For many product types, there are subcategories that are designed to produce even lower odors. Using one of these products can help reduce the effects of the odors, particularly in confined areas or where the public tends to be sensitive.

In addition to low-odor products, there are a few products that can come with an additive that modifies the smell. It changes it from a chemical smell to a more natural one such as oranges or vanilla. While the amount of odor is not lessened, this change will usually reduce



Creating a bypass zone.

the number of complaints. The availability of these additives will vary from manufacturer to manufacturer, so this is something that should be determined during the design stage of the project.

Ventilation

The ventilation in and around the work zone has a big effect on the impact of strong odors on the public. This is in two ways: First, there needs to be enough ventilation so the build-up of fumes can be avoided. If the concentration is kept low enough, it will not be noticed. The contractor may need to supply extra fans to provide an additional flow of air. Using air filters can also help with dispersion of dust.

Just as important is considering where you are venting the odors. You will need to think about such things as where the fresh air intake for neighboring buildings is relative to the work area. It may be necessary to shut off or re-route building ventilation temporarily while the work is being done.

Construction and Structure Use

One of the greatest sources of inconvenience is the number of parking spaces that need to be taken out of service. This disrupts parking operations, displaces some of your parkers, and directly affects revenues. It is necessary to balance the disruption and loss of revenue with the need to get the work completed. Contractors need to take spaces out of service to provide not just a work area but also to allow cars to bypass the work zone to get to other areas of the structure and for safety such as closing the floor beneath where demolition is occurring.

The cost of the project goes up and the duration is extended when the number of spaces available is reduced. A minimum size of the work area is necessary for the contractors to be efficient. If the areas get too

small, the work becomes more expensive and takes longer. The schedule can extend more than would be expected—e.g., cutting the number of spaces available for the contractor in half can more than double the time frame of the project. The number of spaces that can be made available to the contractor must be determined prior to bidding the project and needs to balance the needs of the owner and contractor.

There are a few approaches that can be used to help manage the effects of having spaces out of service, particularly for long-term monthly parkers such as employees. These are more applicable within a parking system with alternative parking facilities available. Prior to the start of the work, the entire parking system needs to be evaluated to determine its capacity relative to demand, even if some of the parking is less convenient. When that has been done, an appropriate system can be put in place to help manage parking needs. Shuttle or valet parking may be needed for the duration of the project. Incentives can be used to encourage use of less-desirable parking. This can be discounted parking, for example, but as an alternative to direct benefits, sometimes a sweepstakes-type incentive may be used. Parkers who agree to give up their monthly parking pass or use a less desirable location could be entered in a monthly drawing for a prize—a television or an iPad or free parking for a year. This is often popular with users as there is the opportunity to get a larger incentive. But the costs for the prizes are less than the cost for providing a smaller incentive to each individual. If parking needs are identified during the planning stages of a project, creative methods can be used to meet them.

Communication

Even with the use of all the techniques discussed above, there still will be some disruption to the users of a parking facility under repair. There is no getting around it. This is when good communication becomes necessary. The more users know what to expect, the better they can plan for it and reduce personal disruption.

Signage is necessary for communicating immediate information and short messages, such as “turn here” or “this area is closed.” Signage should be clear, unambiguous, and easily read. It needs to communicate information while people are driving in a location that is often chaotic and unfamiliar as it can change from day to day.

Longer-term or more complicated information can be posted in elevator lobbies, for example. If there is a large number of monthly parkers and you have their email addresses, information can be communicated to them that way. Important information includes high-level schedule, timing of work area changes, upcoming disruptions, and contact information for problems. **P**



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