



Asphalt Life Cycle and Cost Analysis

Rabine Paving

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Rabine Paving's

Awards & Recognition:

- Pavement Maintenance & Reconstruction 2013 Top Contractor
- Pavement Maintenance & Reconstruction 2015 Top Contractor
- Pavement Maintenance & Reconstruction 2016 Top Contractor
- Best and Brightest Companies to Work for in the Nation Winner – 2016
- Chicago's 101 Best and Brightest Companies to Work for – 2016
- INC. 5000 – America's Fastest Growing Private Companies
- Edison Awards Honoring Innovations & Innovators
- Schaumburg Business Association - Entrepreneur of the Year Award
- Crain's Fast Fifty – Chicago's Fastest-Growing Companies
- MIP – Most Innovative Products at World of Concrete
- Chicago Innovation Awards
- BBB – Accredited Business Award



When Choosing Asphalt Pavement for Industrial or Warehouse Lot

On average an Industrial or Warehouse parking lot will see typically 30 to 100 loaded semi-trucks a day, and averages around 100,000 SF of Pavement Surface.

It is important to keep the following items in mind when making the decision to go with Asphalt pavement for your facility:

- As Mike Harrell just shared, asphalt must be properly designed to account for the loads that will be moving across the pavement. Warehouse or Industrial space will have a greater traffic load and surface weight than that of a typical asphalt lot. Meaning the design will call for thicker asphalt and aggregate sub-base specifications.
- Even with properly designed asphalt for the industrial or warehouse surface, the use of the lot will still cause an accelerated maintenance schedule compared to that of a maintenance schedule of a typical light duty asphalt pavement. Including Seal-coating, crack sealing, patching, and eventually an Asphalt overlay before complete replacement.
- Asphalt pavements hold the market share when considering Light -duty and Heavy-duty applications due to faster return to service timelines, economical repair options, especially in the Midwest handling the temperature fluctuations, freeze thaw cycles and winter salt use.

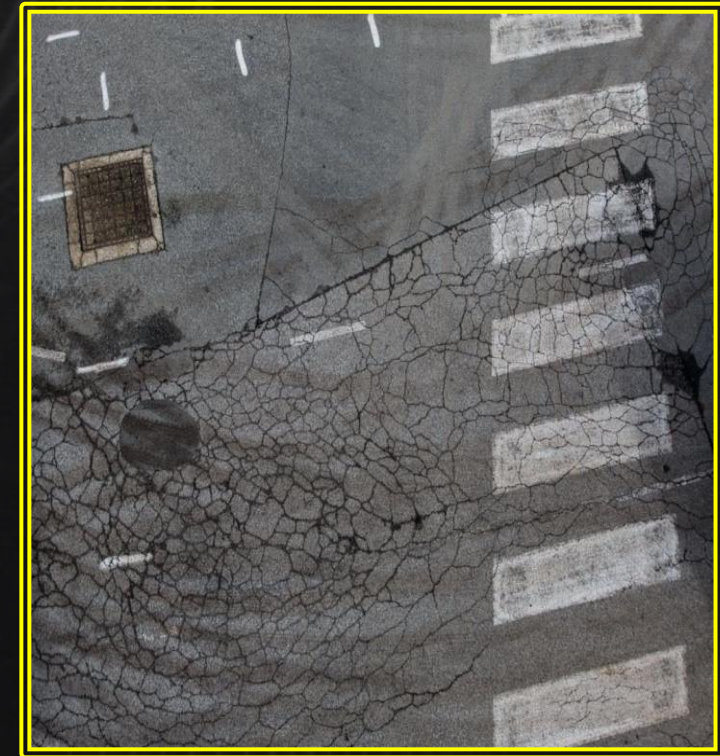


Asphalt Parking Lot Life Expectancy

This depends on key items such as Usage, Soil Conditions, Weather, Etc., but typically is as follows:

- ◆ Parking Lot Reconstruction – Completely new base course and asphalt surface (15-20 Years with routine maintenance)
- ◆ Asphalt Pulverization (13-15 Years)
- ◆ Asphalt Overlay (8-12 Years)

* Another rule of thumb is that if 25-35 percent of the total surface area requires substantial removal, it's often more cost-effective to replace the entire pavement area. Wear and tear on asphalt can be caused by many things such as semi-trucks, constant vehicle traffic, water, and age. As time goes by, the structural integrity of asphalt can weaken and fail – even without water or mechanical forces acting upon it.



What Affects the Pavement Life Cycle

Quality of Initial Construction

Like all structures, how well — and long — Asphalt pavement can fulfill its purpose depends largely on the quality of the initial construction.

Construction begins with an appropriate design, accounting for the expected surface load over the lifecycle. Every design is unique to the location and usage of the lot itself. While there is a starting template for approved designs, each design needs to factor in the outside impact factors specific to the location. The design should include sufficient base support and asphalt depth, or the entire structure is at risk of early failure. This means accounting for the weight and volume of traffic on the surface daily, the turning and parking of items such as trailers on the surface, and the moisture and liquids the pavement will be exposed to.



Five Stages of Asphalt Pavement



The following slides will give a good understanding of what the five stages of Asphalt pavement are, as well as what to expect repair wise and budget wise in these respective stages as well. Again, this is the general template for most lots, it is imperative to keep in mind that each lot and the makeup of each lot is unique to itself and will age accordingly.

One – New Pavement

Two – Initial Preventative Maintenance

Three – Minor Repairs

Four – Major Repairs

Five – Complete Reconstruction

Step One: New Pavement

When the pavement is new, pedestrian and vehicle traffic will experience a smooth surface for the path of travel. Smooth pavements aren't just safer, they also save the facilities money. Reduced wear and tear on vehicles due to fewer bumps in the pavement which bring down vehicle operating costs. New construction generally lasts up to 5 years and requires little to no maintenance, aside from a sealcoat around year's 2 and 4 to protect and seal in the pavement oils.



Step 2: Initial Preventive Maintenance



The frequent scheduled maintenance for Asphalt should be:

- Crack Sealing – This should be done annually after year two, and it is sealing up the existing cracks in the surface to prevent further cracking and moisture getting under the surface to further deteriorate the pavement surface. For reference, it is suggested that any crack larger than $\frac{1}{4}$ " is necessary to be sealed.
 - Sealcoating – This should be done within six months to a year after the surface is paved. After the initial coat sealing should be completed 1 additional time to protect the structure of the pavement surface after that every 3-5 years for protection and curb appeal.
- * It is also important to note that in areas such as the Mid-west these forms of maintenance specifically become drastically more important due to the harsh winters. The moisture that is paired with the snow and rain create a freeze/thaw cycle that prematurely damage the pavement. This portion of maintenance is the shortest of the life cycle starting in year 3 and typically lasting until year 12.



Step Three: Minor Repairs



By the end of Stage 3, the pavement is generally considered midway through its lifecycle. During year 7 through year 10, minimal asphalt patching repairs are normal for fixing potholes and other wear and tear issues. It is also recommended to apply a second, or possibly third sealcoat, depending on the location, while additionally addressing cracking concerns in stage 3. Typical repairs include Saw cut and replacement of Potholes, or Pavement sections where block cracking, rutting and Alligator cracking have appeared.



Step Four: Major Repairs

This stage will start in years 8 through 12, and typically consist of Asphalt Overlays to correct issues and extend the Asphalt Pavement's life cycle.

Sometimes routine maintenance isn't enough. Aging lots, ones that have not been properly maintained, or those that see lots of usage from heavy vehicles, may require more extensive repairs. For lots with numerous cracks, large potholes or heaving, patching or partial resurfacing could be necessary. But what is the difference?

Patching of surface potholes, block cracking, and alligator cracking are examples of pavement stress repairs that will need to be addressed to salvage pavement structure.

When only the top layer is compromised or surface cracking is limited, resurfacing is an economical option. This involves removing the damaged layer and replacing it with a thicker surface. The result is a parking lot that looks like new.

Water and ice are two of the most destructive elements to asphalt. They can turn a small crack into a major pothole in a matter of a few days.



Step Five: Complete Reconstruction

The fifth and final stage usually occurs between 15 years to 20 years after the initial installation. If the surface has reached complete disrepair, removal and full replacement is necessary. Due to Lower temperatures and the moisture freezing under the surface in colder areas such as the Midwest tend to be on a slightly increased schedule. Although a more extensive — and expensive — process, repaving is necessary when surface cracking is substantial, or your foundation is compromised. When this happens, the old asphalt is removed, and your parking lot is completely regraded and replaced.

Therefore, proper maintenance, assessments, and repairs are essential to sustaining the pavements life cycle. As previously mentioned, asphalt patching in the drive lanes and corrective measures around the storm structures to allow proper drainage are essential to prolonging the surface's life cycle.



Summary

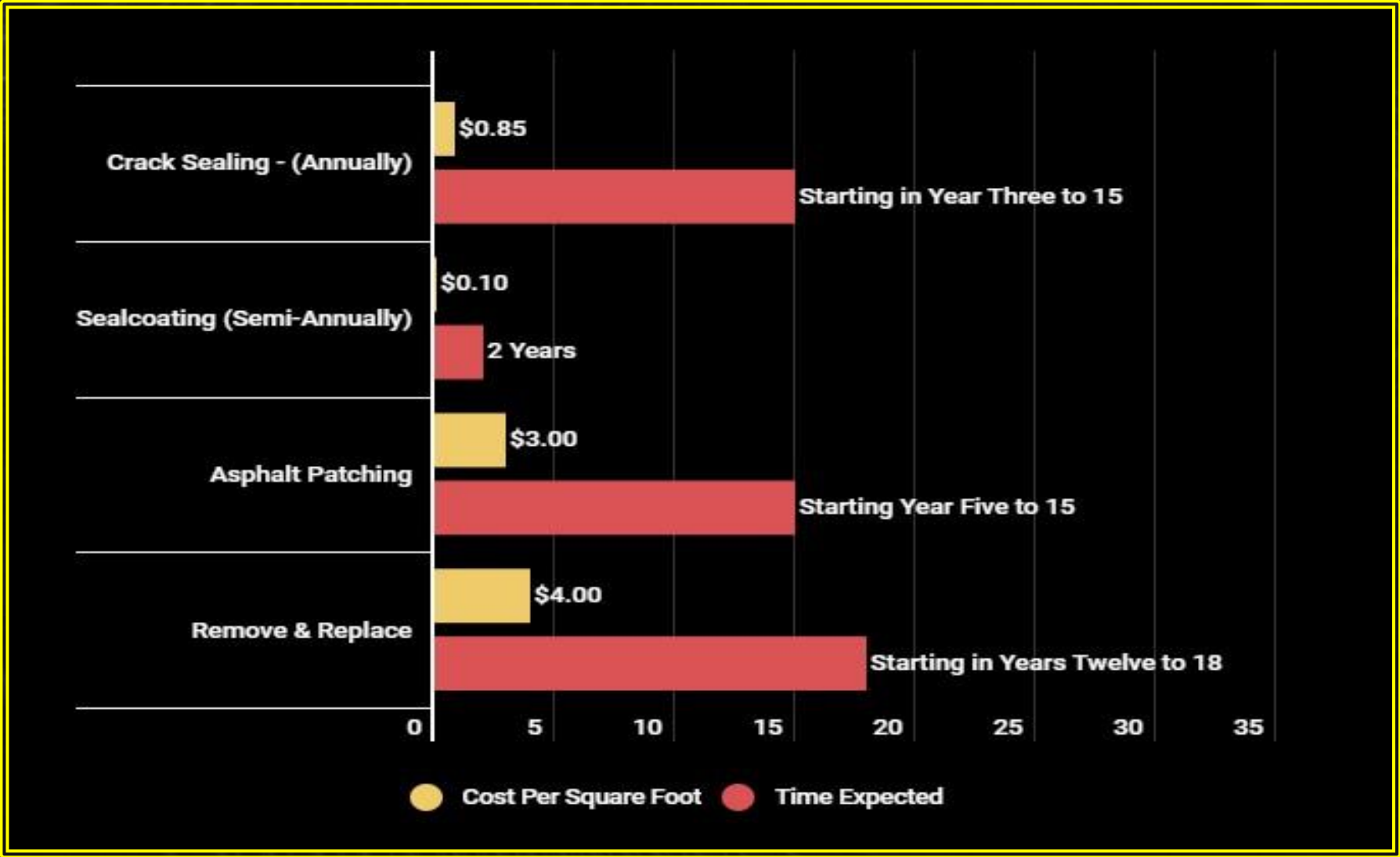


Again, the typical Industrial or Warehouse lots are usually based off 100,000 SF or more and 30 to 100 loaded trucks a day moving across the pavement. The composition of an Industrial or Warehouse lot will start around 6.00" of Asphalt and 10.00" of Aggregate Base. The Asphalt will be 4.00" HMA Bituminous Binder Course, and 2.00" HMA Bituminous Surface Course. Along with the proper design, it is essential that the proper compaction is used to achieve the correct density, as well as making sure that the subgrade is in good condition.

Cost Outline:

- Sealcoating starting in Year 2 at around \$0.10 per SF
- Crack Sealing Starting in Year 3 Budget for at least \$1,500.00 a year, and expect additional costs
- Patching starting around year 5 plan for around 5-10% of the lot at \$3.00 - 5.00 per SF
- Overlay or Resurface in Years 12 and beyond

Summary Continued



Pavement Condition Index



The pavement condition index (PCI) is a numerical index between 0 and 100, which is used to indicate the general condition of a pavement section. The PCI is widely used in transportation civil engineering and asset management, and many municipalities use it to measure the performance of their road infrastructure and their levels of service. It is a statistical measure and requires manual survey of the pavement. This index was originally developed by the United States Army Corps of Engineers, but later it was standardized by the ASTM (American Society for Testing and Materials). The surveying processes and calculation methods have been documented and standardized by ASTM for both roads and airport pavements.

Condition Index - PCI

- Bleeding
- Block cracking
- Bumps and sags
- Alligator Cracking
- Depressions
- Edge cracking
- Joint reflections
- Lane/shoulder drop-off
- Longitudinal and transverse cracking
- Low ride quality
- Patching and utility cut patching
- Polished aggregate
- Potholes
- Rutting
- Shoving
- Slippage cracking
- Swelling
- Weathering and raveling

