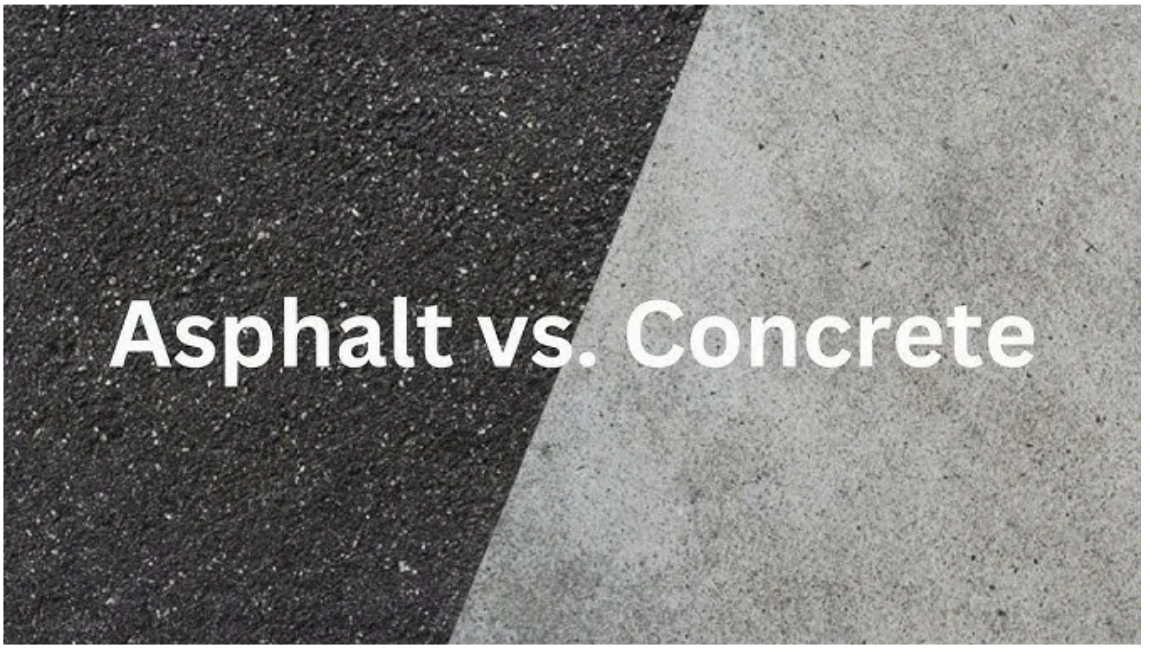
HAHN READY MIX

Asphalt vs Concrete

Technical Bulletin #38 - February 2025



Old Adversaries

If you work in construction, the argument over the benefits of concrete vs asphalt has almost certainly been a topic of conversation at one point or another. While the facts thrown out are fast and loose, and the catch-phrases even better ("If you don't use Concrete it's your own Asphalt"), we are here to set the record straight to compare the two products and their respective strengths and weaknesses.

First, let's talk about what each material is actually made of. Asphalt is a flexible pavement, made up of aggregates and a bitumen binder. Sometimes recycled rubber or other additives are also part of the mix.

Concrete is a rigid pavement made up of aggregates, water and cement as a binder. As you know from previous tech bulletins, there are numerous additives, SCMs, fibers or materials that can be utilized to change the properties of the mix.

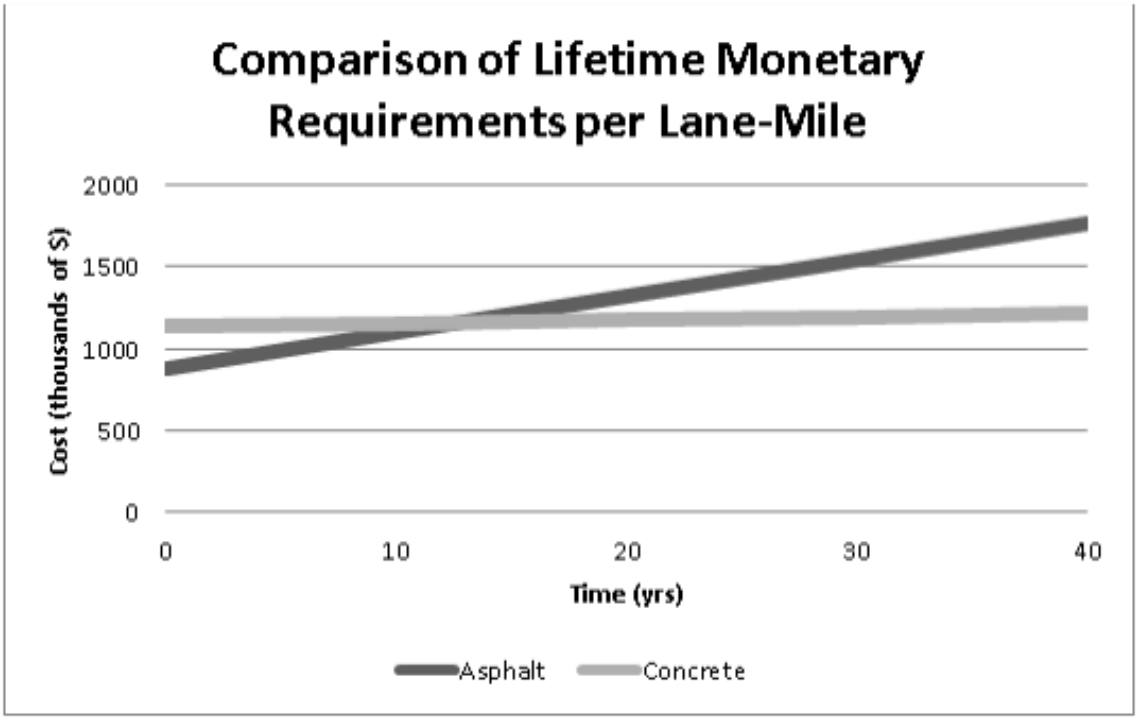
Cost

The first item for most decision makers when choosing between concrete and asphalt is "what is this going to cost". And there is no question, asphalt is cheaper in initial costs. Although there are variable performance grades of both asphalt and concrete, it's currently the case that asphalt is about 10% cheaper for the material if you convert both to tons. One caveat is that asphalt pricing is affected by petroleum pricing, as bitumen is a petroleum byproduct. High petroleum pricing often means more expensive asphalt. Labor and equipment can be highly variable depending on the type of job you are having done, although the lack of necessary forming means that typically asphalt labor is cheaper as well. In addition, it's common for asphalt to be placed in thinner sections than what would be used with concrete. In all, total initial costs of asphalt construction might be as much as 20-30% lower than concrete in times of low bitumen costs, and have parity with concrete in times of high bitumen costs.

However, as we'll touch on below, concrete lasts significantly longer than asphalt, with much less maintenance costs. A federally-funded interstate study showed that concrete costs 13-28% less in the long run than asphalt, a study in Poland found that concrete was 5-35% cheaper than asphalt in a 40 year life cycle and another study showed that concrete was cheaper after 13 years in service. The Iowa Department of Transportation has leaned heavily on life-cycle analysis when determining the use of concrete or asphalt, and as a result ~50% of the Iowa interstates and municipal roads are concrete... by far the highest proportion in the country.

On parking lots, some of the initial costs can be mitigated if a concrete curb is needed by pouring an integral curb at the same time as the pavement, eliminating the need for an extra contractor to mobilize to the site and working time. As a note, 70% of parking lots in Iowa are concrete.

Advantage: Asphalt (initial), Concrete (long-term)

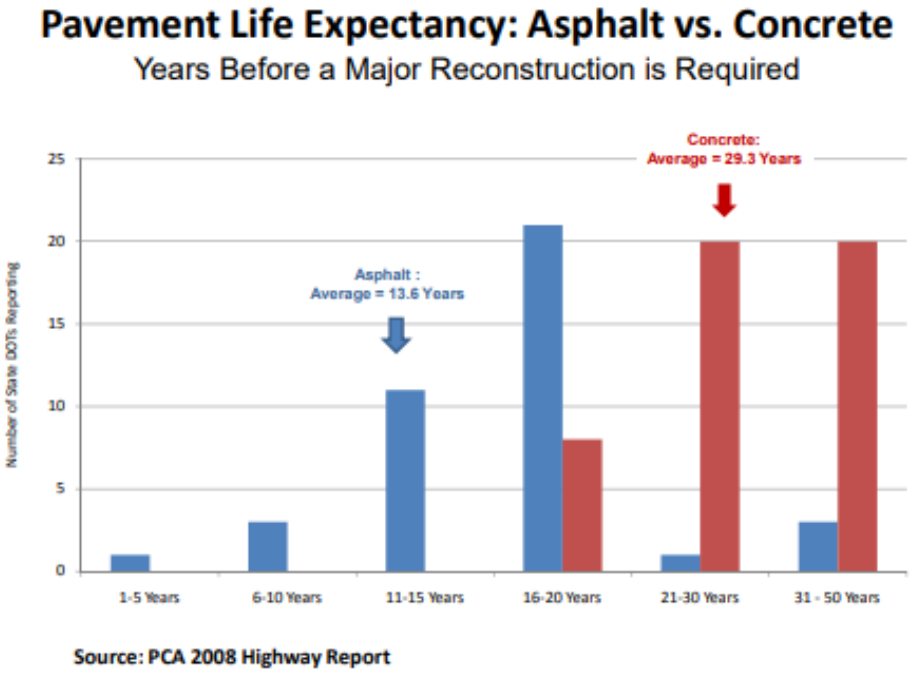


Durability

The longevity of a pavement depends heavily on the specific materials used and the environment and wear applied to it, but a general rule of thumb is that concrete can be expected to last 30-50 years without replacement, and asphalt can last 10-20 years without replacement. That being said, there are specific traits of each pavements that may inform a decision in a particular environment. In cold weather, asphalt is particularly prone to cracking and deterioration. Concrete holds up well in that regard, but there is a risk of surface scaling which doesn't affect asphalt. In very hot climates, asphalt can almost re-emulsify and heal itself of small cracks, but also becomes soft and prone to rutting. Salts can be tough on both materials if not properly sealed, but gasoline spills are incredibly damaging to asphalt.

Concrete has significantly superior wear resistance and the ability to handle heavier loads.

Advantage: Concrete



Maintenance and Repair

For asphalt to meet it's life expectancy, it's critical that a blacktop sealer be applied every couple years. A penetrating concrete sealer need only to be added once, although subsequent applications don't hurt anything. Concrete is easy to maintain and clean, with simple tools like a broom and pressure washer. Asphalt, on the other hand, needs vigilance in crack repair and sealing.

Rutting, potholes, and other deterioration of an asphalt surface require frequent patching and repair. Typically, concrete doesn't see these issues, although joint

life may not match pavement life in heavily salted environments. Patching asphalt surface is significantly cheaper and easier than doing the same to concrete.

Advantage: Concrete

Installation and Opening Time

One major benefit to asphalt is the construction time and opening time after construction is complete. Asphalt construction tends to be quicker, allowing for less traffic disruption. Additionally, asphalt can be driven on the same day or the day after being paved, while conventional concrete needs 3-7 days before traffic can be applied.

Advantage: Asphalt

Safety

While both pavements are a major step up from an unpaved road, there are some differences in safety between them. Concrete pavements are not prone to potholes that cause accidents or vehicular damage that are so often seen on asphalt pavements. Properly tined or roughened concrete surfaces have superior traction allowing for shorter stopping distances in wet or dry conditions. Finally, concrete doesn't suffer from the same degree of visibility issues of asphalt pavements when it is raining in the dark.

Advantage: Concrete

Fuel Economy

Due to the increased traction, vehicles can enjoy a 10% increase in fuel efficiency when traveling over concrete roads instead of asphalt roads. This amount may be even higher for commercial vehicles.

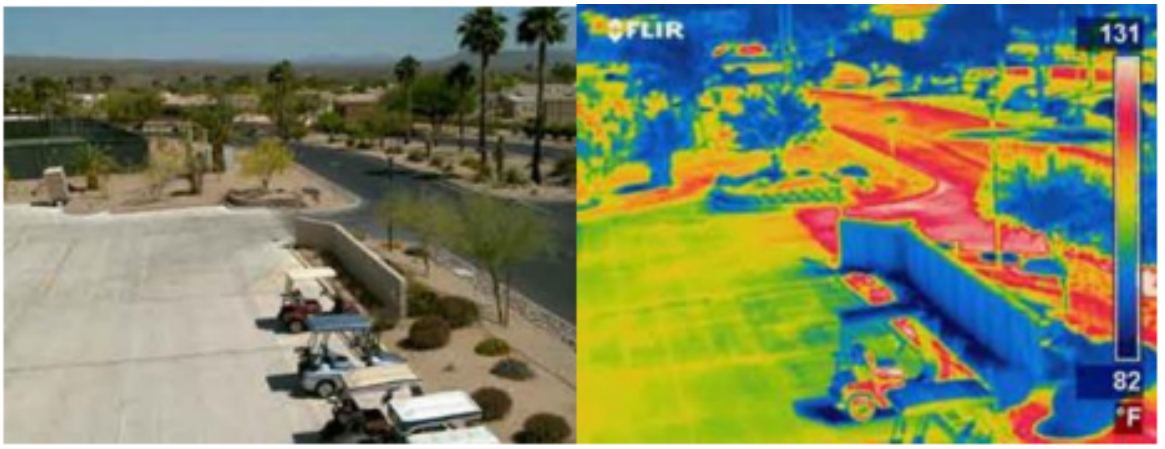
Advantage: Concrete

Sustainability

The simple truth to this is neither material is particularly environmentally-friendly. Both materials are 100% recyclable, although the uses for recycled asphalt are potentially more impactful. The emissions of the cement production process is significant as is the emissions from the production of HMA. Looking at some sample EPDs from the Des Moines area, asphalt seems to have about 25% reduced carbon emissions per ton produced. Unlike Asphalt, however, concrete is a carbon sink, meaning it will absorb carbon from the atmosphere over it's life. At a maximum, concrete can absorb 60% of the carbon emitted through it's production. A practical estimate is that concrete absorbs 25% of it's emitted carbon from production over it's lifetime... meaning the net carbon footprint is the same as asphalt over the life of the pavement. If one then considers the longer life and lower maintenance of concrete, it starts to be much more sustainable to use concrete than asphalt.

Concrete also helps minimize the "Heat Island Effect" often seen in big cities, because it reflects much more sunlight than asphalt, which absorbs this heat. Concrete pavements can be 10°F cooler in the summer than asphalt, simply from reflectivity. This increased reflectivity can also cut down on lighting needs for a roadway or parking lot.

Advantage: Similar to cost, asphalt results in slightly lower initial emissions, but concrete is more sustainable in the long run.



Customization

A major benefit of concrete is a greater ability to customize the pavement to meet your needs. Colors, stamped patterns, shapes, thicknesses, and options for added materials mean concrete can be made to suit the durability, aesthetics, and design requirements of your project.

Advantage: Concrete

Conclusion

Asphalt and Concrete both have their uses, strengths, and weaknesses. Which product is the right one to use depends heavily on the project. In light of this, we won't say that one product is definitively better than the other...

Ok, maybe we will.

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