

Comparison of Asphalt and Continuously Reinforced Concrete Pavement

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Abstract--Transport is a vital infrastructure for rapid economic growth of the country. Speedy transportation of natural resources (such as raw materials), finished goods and perishable materials to all parts of the country including the points of export outlets are basic inputs to economic growth. In India flexible pavement (bitumen) is most common for both national and state highways. Majority of roads are also built with conventional bitumen pavements considering its lower initial cost, though the life cycle cost of these pavements are very high compared to rigid pavements due to frequent repairs and also need for complete resurfacing at interval of 4-5 years. Further fuel consumption of vehicles is much higher on this type of pavement than that on rigid pavement. In advanced countries rigid pavement is increasingly being used due to large number of benefits it offers. Continuously reinforced concrete pavement, (CRCP) eliminates the need for transverse joints (other than at bridges and other structures) and keep cracks tight, resulting in a continuous, smooth-riding surface that is virtually maintenance free.

I. INTRODUCTION

A. Background

Roads fulfil a crucial function in modern society, providing increased mobility for people, goods and services. They have played a key role in Indian progress and continue to drive socio-economic growth. Transport on roads can be roughly grouped into the transportation of goods and transportation of people. In many countries licensing requirements and safety regulations ensure a separation of the two industries. Today roadways are principally asphalt or concrete. Both are based on McAdam's concept of stone aggregate in a binder, asphalt cement or Portland cement respectively. Asphalt is known as a flexible pavement one which slowly will "flow" under the pounding of traffic. Concrete is a rigid pavement, which can take heavier loads but is more expensive and requires more carefully prepared sub base. So, generally, major roads are concrete and local roads are asphalt. Often concrete roads are covered with a thin layer of asphalt to create a wearing surface.

1) What Is Asphalt?

Asphalt also known as bitumen is a sticky, black & highly viscous liquid or semi-solid form of petroleum. It may be found in natural deposits or may be a refined product; it is a substance classed as a pitch. The primary use of asphalt/bitumen is in road construction, where it is used as the glue or binder mixed with aggregate particles to create asphalt concrete.

2) What Is Continuously Reinforced Concrete Pavement?

In concrete pavement the longitudinal reinforcing steel is continuous throughout the pavement length. It is a joint less concrete pavement sufficiently reinforced to control

cracking, without the aid of weakened transverse joints such as are used in ordinary or conventional type of jointed concrete pavement. Reinforced bars in the concrete are lapped to form continuous reinforcement holding the pavement together in all kinds of weather and preventing formation of large cracks that would otherwise reduce the service life of the pavement. CRCP has all the good features of concrete pavements such as durability, high structural strength, nonskid surface and good visibility at night, wet or dry—features which make concrete, and especially continuously reinforced concrete, a permanent road surfacing material.

B. Comparison Of Asphalt & Continuously Reinforced Concrete Pavements

1) Physical Differences between Concrete and Asphalt.

Hot mix asphalt is made of aggregates (stone, sand, gravel) and liquid asphalt, the oil-based glue which is the glue that holds everything together. Concrete is made from American materials such as limestone, rock and water. Concrete is also the most-used manmade material in the world.

2) Safety Differences between Paving with Concrete or Asphalt.

Areas paved with asphalt require more maintenance than those paved with concrete. As a result, there is less need for repair crews to handle maintenance of concrete streets and parking lots. This means less congestion and disruption to work areas, and less danger to road crews and drivers alike. Rigid concrete is also more durable than asphalt. This means that streets paved with concrete are less likely to have potholes. The surface of concrete is also better at preventing automobile skidding, keeping drivers and their families safe.

3) Cost Differences of Building & Maintenance of Paving Materials.

Concrete pavement's life can range anywhere from 20-40 years. But when you factor in annual maintenance, asphalt pavement can cost four to seven times as much money to maintain. This saves you long-term on repair and maintenance. So paving with concrete means less need for maintenance over the life of your street.

4) Environmental Differences of Paving Materials.

Concrete is 100% recyclable, and the most recycled construction material in the world. So rather than ending up in your state's landfills, it can be broken down and used in new pavement, or for other construction purposes. According to a Federal Highway Administration technical advisory (T5080.3), it takes over five times as much diesel fuel to make asphalt than it does to make concrete for a road designed for the same amount of traffic. America's Federal Highway Administration also reported that roughly 1.2 billion gallons of diesel could be saved every year if paving was done with concrete instead of asphalt. So how much fuel is 1.2 billion gallons, exactly? Enough to fill up the tank on a Ford F-350 pick-up truck every day of the year,

for 86 years straight. And that's just what is wasted on fuel in only one year. Since concrete pavement requires less repair and maintenance over time, less energy and fuel is needed for heavy construction equipment.

5) How Concrete Affects Lighting & Electric Bills?

As you probably already know, it's best to wear bright or white clothing if you want to reflect the sun on hot days. Dark colors absorb more heat, and the same applies to paving materials. Concrete is light, and naturally reflective. Asphalt is black, and absorbs more heat. So what difference does all that really make? For one, it keeps the areas around the pavement cooler, which means less waste of electricity for air conditioning. Since lighter colored pavement reflects indoor light better, it means you get the same visibility, but with less light needed. That study also pointed out that with less light, there would be more money saved when it came time to install, operate, or maintain them. And as most people know, less lighting means less heat, and less need to run the air conditioner. For businesses that operate at night, having a concrete parking lot means better lighting, and increased safety. Not only will it be easier for people to see, but a parking lot with better visibility can make people feel safer, which makes your business more inviting.

6) So Which Pavement Material is Right for You?

When it comes to safety, durability, and environmental impact, concrete paving is obviously the best choice for street paving and construction.

II. CONCLUSION

- 1) Concrete roads are more durable than asphalt roads.
- 2) Frequent repairs are not needed for concrete roads when compared to asphalt roads. Extreme weather conditions are liable to damage asphalt roads more than concrete roads.
- 3) Maintenance is easier with asphalt roads. Maintenance of a part of the asphalt road is possible.
- 4) Concrete roads are not damaged from oil leaks, like asphalt roads.
- 5) Concrete roads come with a higher paving cost than asphalt roads. Moreover, it takes less time to lay an asphalt road than a concrete road.
- 6) Asphalt roads have better skid resistance and provide good traction. Snow melts faster on asphalt roads than on concrete roads.

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