

What you need to know about...

Pavement

What it is

VIRTUALLY ALL CANADIAN highways, roads and paths are paved with asphalt, a mix of about 95 percent aggregate (stones, sand) and five percent oil-based binder. Concrete runs a distant second, although the Canadian Cement Association touts it as a better pavement because of its longer life and a rigidity that prevents rutting, better known as potholes. Yet Canadian governments and private industry choose asphalt for its flexibility, ease of application, imperviousness to de-icing salts and chemicals and less-expensive life cycle.

Depending on load requirements and climate conditions, there are different concentrations of aggregate and binder. Until a decade ago, the constituent materials rarely varied.

"We use a proven (asphalt) product, but technology is giving us better choices, such as softer asphalt binder and improved aggregate durability," says Ed Shearer, technical supervisor for Prince George, BC. (See also *From Landfill to Roadbed*, page 26.)

That technology also created Superpave, which uses courser aggregate with increasingly high-performance polymer binders. Broadly used in the US, Canada has been slow laying it over roadbeds because of higher costs: \$30 per square metre compared to around \$12 for current asphalts.

Asphalt is usually applied as a hot-mix, ranging from 145-160 degrees Celsius. It is also used for airport runways, tennis courts, industrial-container linings, parking lots, rail beds and sea walls.

How it works

Any pavement does its best job by remaining unnoticed. US government statistics show that Superpave asphalt reduced traffic accidents due to pavement condition by as much as 30 percent during the 1990s. This happened by improving water drainage, skid resistance and durability while reducing rutting in summer and thermal cracking in winter.

The oil-based binder in asphalt makes the surface flexible under even the most-severe weather conditions. On high-speed roads or runways, surfaces are now designed like bridges and modeled to move in response to different loads and conditions. Less-viscous binders reduce friction and therefore the noise in high-use areas.

Increasing traffic volume brings greater axle loads and tire pressure. This trend means pavement surfaces break down more quickly (asphalt is usually replaced every 12 to 15 years). Improved road tolerance, durability and even comfort depend on high-quality aggregate – becoming increasingly difficult to find, which is why asphalt recycling is another area of technological innovation. Paving equipment can now chop up old asphalt and concrete – "rubblize" – and contiguously lay it as a base for new asphalt surfaces, providing cost and environmental benefits.

Cement pavement lasts much longer than asphalt, doesn't produce ruts and rarely moves during climatic changes. But once it breaks up, the entire bed must be replaced by new material. Both

cement and asphalt experts can supply test results proving their product is quieter, safer and more cost-efficient. Buyers need to find out which material best-fits their requirements.

What's next

Poor roads cost each car owner about \$200 a year in deterioration; there are almost 20 million vehicles in Canada. This mathematical equation demands improved pavement.

The Canadian Strategic Highway Research Program (C-SHRP) is winding up a 15-year study that will outline the future of Canada's highways – one that must marry increasingly complex traffic patterns to road longevity and conservation issues.

Technological improvements focus on materials and application methods because this is where the greatest gains can be made at the lowest cost. This research is front and centre at the Civil Engineering Departments at the University of New Brunswick, the University of Calgary and Carleton University.

Carleton's Centre for Advanced Asphalt Research and Technology (www.cee.carleton.ca/CAART) has developed revolutionary compaction machines that can virtually eliminate asphalt rutting and create zero-shear viscosity. Research at other institutions in Canada and the US will: improve surface flexibility with more specialized binder polymers; increase durability (and lower noise) with new aggregate substrates, such as rubber; and decrease costs by lowering application temperatures and improving recycling and rejuvenating techniques.

There are some suggestions that Canadian customers should demand pavement-performance guarantees from contractors, similar to those in many European countries. But the next big thing in pavement technology is rubberized asphalt, which uses crumb rubber (from old tires) as part of its aggregate mix.

Tests in the southern United States show this surface improves skid resistance by 200 percent and ride quality by 60 percent while reducing decibel levels by up to 50 percent. It is significantly more expensive than Superpave, although costs are expected to drop dramatically during the next three to five years.

Vendors

There are hundreds of pavement companies in Canada. Selection requires the same due diligence as choosing a construction company. A place to start is the Canadian Construction Association (www.cca-acc.com) and its "members" link. The Asphalt Institute (www.asphaltinstitute.org) also offers choices with links to Canadian members. For asphalt projects, the Ontario Hot Mix Producers Association (www.ohmpa.org) has a broad vendor membership. The Cement Association of Canada (www.cement.ca) offers the same information for concrete vendors. For those wanting public-sector direction, try contacting the Canadian Strategic Highway Research Program (www.cshrp.org). ■■■

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