

**PAVEMENT STRUCTURE AND VEHICLE FUEL CONSUMPTION:  
Summary of a report by the Centre for Surface Transportation Technology (CSTT)**

The National Research Council's Centre for Surface Transportation Technology (CSTT) conducted a study on pavement fuel efficiency for the Cement Association of Canada and Natural Resources Canada. Flexible pavements, such as asphalt, deflect energy that normally moves the vehicle and are thought to have higher fuel consumption than more rigid pavements, such as concrete. This is especially true for heavy vehicles.

The third phase of this study involved testing whether a highway tractor with a van semi-trailer driven over different types of pavement would display fuel savings based on pavement type.

The three types of pavement tested were concrete, asphalt and composite (an asphalt coat over concrete). The tests were done in all seasons at two speeds (60 km/h and 100km/h) with both loaded and empty trailers. The tests also measured the International Roughness Index (IRI) (to test for smoothness), road curvature, grade and the strength of the road bed. This data was used to generate models for various conditions and generated multiple regression formulae. The results are based on the test routes run in Ontario and Québec and do not quantify the grades of the surface, nor do they quantify irregularities or properties. Limited passenger car data was also collected.

This phase of the study found that concrete generally provided fuel savings over asphalt and composite pavements. However, under certain conditions during summer days, composite pavements provided fuel savings over concrete pavements. Fuel savings ranged from 0.8 per cent to 6 per cent for tandem drive tractors pulling van semi trailers on concrete over asphalt or composite pavements. This study found that for passenger vehicles concrete only showed significant fuel savings over asphalt in winter and over composite pavements in summer. The results of the tests from Phase III of this study can be found in the following two tables:

Table 1.  
Average fuel savings for tandem drive tractors pulling a van semi trailers on concrete, asphalt and composite pavements

<b>Pavements being compared*</b>	<b>Speed (km/h)</b>	<b>Load</b>	<b>Fuel savings (L/100 km)</b>	<b>Fuel savings (%)</b>
<b>Concrete</b> -asphalt	100	Empty and full	0.4 to 0.7	0.8 to 1.8
<b>Concrete</b> - composite	100	Empty	0.2 to 1.5	0.8 to 3.1
<b>Composite</b> – concrete (summer days)	100	Empty	0.5	1.5
<b>Concrete</b> - composite	100	Full	0.4 to 1.2	0.8 to 2.6
<b>Composite</b> – concrete (summer days)	100	Full	0.5	1.3
<b>Concrete</b> - asphalt	60	Empty	0.4 to 0.5	1.7 to 3.9
<b>Concrete</b> - asphalt	60	Full	0.2 to 0.4	1.3 to 3
<b>Concrete</b> - composite	60	Empty	1.1 to 1.9	2 to 6
<b>Composite</b> - concrete (summer days)	60	Empty	0.2	3
<b>Concrete</b> - composite	60	Full	0.6 to 1.4	1.9 to 4.1
<b>Composite</b> – concrete (summer days)	60	Full	0.2	2.4

\* The type of pavement in **bold**print showed fuel savings over the other type of pavement listed

Table 2.  
Average fuel savings for passenger cars on concrete, asphalt and composite pavements

<b>Pavements being compared*</b>	<b>Season</b>	<b>Fuel savings (L/100 km)</b>	<b>Fuel savings (%)</b>
<b>Concrete</b> - asphalt	winter	0.3	2.9
<b>Composite</b> - concrete	winter	0.2	2.3
<b>Concrete</b> - composite	summer	0.1	1.5
Concrete - asphalt	summer	0.05	0.3

\* The type of pavement in **bold**print showed fuel savings over the other type of pavement listed

For a summary of the study by the Cement Association of Canada please see:  
<http://www.cement.ca/cement.nsf/internet/FE675149E87F263F85256AA400554CB4?OpenDocument>