

Quantifying Energy Consumption and Carbon Equivalent Generation in Roadway Construction

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Abstract



Over the past number of years the importance and need for sustainability has been brought to the forefront of our society. For a project to be sustainable, economical, social and environmental needs and benefits must all be achieved. Rating systems have been developed to identify projects that work towards achieving sustainability. These rating systems can also be used as a tool by agencies for decision making purposes for what type of road rehabilitation method or construction should be used.

Two thirds of man-made greenhouse gases are coming from the burning of fossil fuels. In 2009 Canada committed to the Copenhagen Accord to reduce greenhouse gas production across the nation by 17% from 2005 levels by 2020. By reviewing and quantifying the energy consumption and carbon equivalent generation values for alternative methods of roadway construction and rehabilitation, environmental considerations can be included in the decision making process.

To quantify energy consumption and carbon equivalent generation, a model will be constructed. The inputs for the model are divided into two groups – user inputs and material/rate inputs. The user inputs will consist of the pavement structure, typical cross-section and the length of the proposed road. The material/rate inputs will be internal to the model and consist of the energy and carbon equivalent rates for the production and placement of the materials used in roadway construction.

Four sub-models are then developed that will quantify the energy consumption and carbon equivalent generation. The four sub-models will include material production, material hauling, material placement and the energy input costs. From these models the total outputs of energy consumption, carbon equivalent generation and energy costs can be achieved.

Once this model is developed various methods of roadway construction will be used as case studies and will include cold-in-place recycling, use of off-site recycled rubble materials, full depth reclamation, mill and fills, thin overlays, traditional construction of flexible pavements and cold mix surfacing.

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