WAPA
WISCONSIN ASPHALT PAVEMENT ASSOCIATION

TECHNICAL BULLETIN

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Life Cycle Cost Analysis for Pavement Selection

Life cycle cost analysis is a decision-making tool that factors in both present-day costs of building a pavement and projected costs of maintenance and repair over the duration of the analysis period.

Benefits of LCCA

With LCCA (Figure 1), a pavement owner can compare alternative cost estimates for similar projects and make informed decisions based on which will be the least expensive in the long run. LCCA compares such factors as pavement materials, rehabilitation strategies (including frequency and scope of repairs for the alternatives under consideration) and work zone issues.

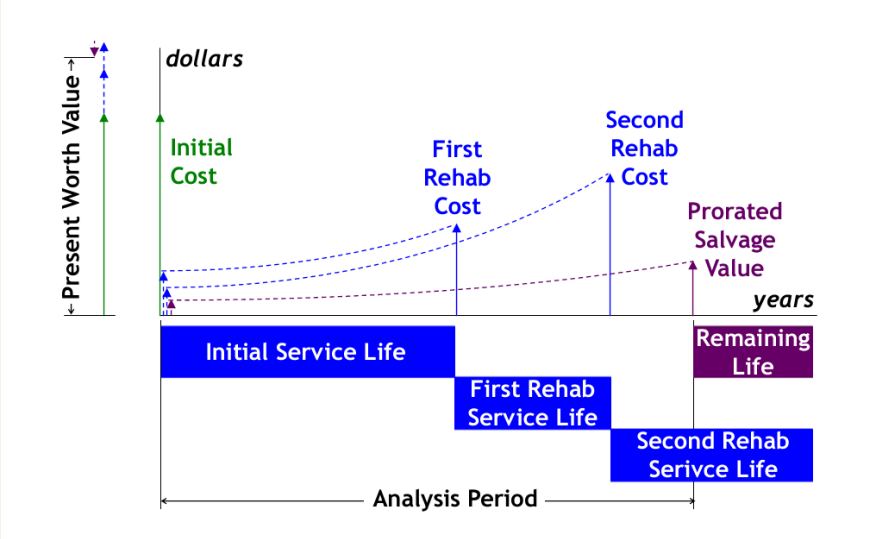

Figure 1 LCCA systematically considers costs over the analysis period.

For a proper LCCA comparison, the time period for the analysis should be:

- → Equal for all alternatives under consideration
- → Long enough to include at least one major rehabilitation
- → Long enough to distinguish cost differences

Common missteps and how to avoid them

LCCA can be manipulated and misused as a sales tool. However, LCCA remains a powerful, money-saving technique when used properly and in accordance with both Federal Highway Administration guidelines and Wisconsin Department of Transportation policy. (WisDOT's Facilities Development Manual conforms to FHWA's guidelines on LCCA.) Awareness of the following principles will prevent false starts and misinformed decisions.

LCCA is not a budgeting tool

LCCA is a tool for comparing alternatives; it is not intended to be a budgeting tool. It is based on the current and future spending power of money, but it does not include all roadway construction project costs that local governments will need to budget for when they develop a construction program.

Discount rate and inflation rate are not the same

To make valid cost comparisons, LCCA converts all future costs into present-day real dollars (rather than mixing current dollars and inflated future dollars). This conversion is done through a process called **discounting**. LCCA uses a **discount rate**, which is an expected rate of return for investment of public funds.

FHWA recommends these practices for LCCA:

- → Always use real dollars and real discount rates.
- → Use a positive, real discount rate greater than 2 percent. (WisDOT uses 5 percent.)
- → Never use a variable or negative discount rate, and don't substitute inflation rates for the discount rate.

LCCA must include maintenance and repair for all alternatives

WisDOT follows FHWA standard procedure in assuming that asphalt and concrete pavements alike will require one or more major rehabilitations during their service lives (Figure 2). LCCA comparisons that do not include repair and rehabilitation are considered invalid.

Figure 2 LCCA reflects the reality that all pavements, including concrete pavements, will need rehabilitation.

Local governments are encouraged to use Wisconsin Information System for Local Roads pavement condition data to determine appropriate pavement service life and frequency of maintenance and rehabilitation.

Other considerations for pavement selection

The fundamentals of LCCA are sound, but today's methodologies are not the last word in pavement selection.

LCCA is changing

Comparing alternative pavements and their expected performance in the future requires handling uncertainty. LCCA can use different approaches to uncertainty:

- → With a **deterministic** approach, input values to the analysis (cost, time, discount rate) produce just a single output cost. Inputs must be changed one at a time to produce and compare best, worst and most likely cases.

→ With a **probabilistic** approach, input values to the analysis are defined as a range of values and their probability of occurrence. Then, through simulation, output cost is expressed as ranges of values, also with probabilities of occurrence.

Wisconsin is following the national trend toward the more scientific and rational probabilistic approach.

LCCA does not tell the whole story

LCCA is just one important part of the decision-making process. When weighing the options for a new pavement, local governments should consider other benefits and features. For example:

→ What is the cost of the inconvenience and downtime to commuters and storefront business owners? **Asphalt pavements can be used as soon as they have cooled; concrete pavements require a week or more of curing time.**

→ What are the sustainability and environmental impacts of the pavement? **Asphalt is the only pavement that can be fully recycled, with reusable aggregate and binder.**

These and other factors beyond the scope of LCCA should be part of an informed pavement choice.

The Wisconsin Asphalt Pavement Association can answer questions and provide further guidance about LCCA. Contact WAPA at 608-255-3114, **strand@wispave.org** or **wispave.org**.

LCCA resources

The following sources provide definitive information about using LCCA for pavement selection.

Wisconsin practices and policies

WisDOT's Facilities Development Manual, "Life Cycle Cost Analysis Computation Parameters" for pavement selection, https://trust.dot.state.wi.us/static/standards/fdm/14-15.pdf

WisDOT software for LCCA calculations

WisDOT's design program WisPAVE, ftp://pavuser:dotpave@ftp.dot.state.wi.us/design/software/WisPave/

FHWA software for LCCA calculations

RealCost software based on FHWA's best practices and methods, www.fhwa.dot.gov/infrastructure/asstmgmt/lccasoft.cfm

LCCA definitions and underlying principles

FHWA's report "Life-Cycle Cost Analysis in Pavement Design," isddc.dot.gov/OLPFiles/FHWA/013017.pdf