Calendar Year 2013 Report on

Life-Cycle Cost Analyses

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Prepared by

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Legislative Request

This report is required by Minn. Stat. 174.185, which requires a life-cycle cost analysis for every project in the reconditioning, resurfacing and road repair funding categories constructed after July 1, 2011. The LCCA is a comparison of life-cycle costs among competing paving materials using equal design lives and equal comparison periods. Documentation required by the statute includes:

- Lowest life-cycle cost
- Alternatives considered
- Chosen strategy
- Documented justification, if the chosen strategy isn't the low cost

The cost of preparing this report is under $5,000.

Implementation

Minn. Stat. 174.185 requires a life-cycle cost analysis for every project in the reconditioning, resurfacing and road repair funding categories constructed after July 1, 2011.

MnDOT first implemented a LCCA process for roadway rehabilitation projects in 1999. That LCCA process was modified in 2010 to meet the specific requirements of legislation approved in 2008. The current LCCA process is provided and presented in Technical Memorandum 10-04-MAT-01.

This memorandum requires that a LCCA that is consistent with Federal Highway Administration guidelines is performed on all projects in the reconditioning, resurfacing and road repair funding categories. The memorandum limits the LCCA requirement to projects greater than two miles in length or more than 30,000 square yards. The memorandum also limits the requirement for a LCCA to projects that include placing more than two-inch thickness of pavement material. Thin overlays of two inches or less are considered short-term preventive maintenance and do not have a viable concrete alternative with an equal design life.

The memorandum requires that the LCCA includes at least one Portland Cement Concrete and one hot-mix asphalt alternate with equal design lives. To best determine the most cost effective design, the memorandum also allows the LCCA to include additional alternatives with other design lives.

Results

In 2013, 65 construction projects were in the reconditioning, resurfacing and road repair funding categories that require a LCCA, according to Technical Memorandum 10-04-MAT-01. LCCAs were not submitted for two projects; both of these projects were awarded as experimental indefinite delivery/indefinite quantity contracts. In addition, the LCCA of one project did not meet the requirements of equal design lives for the HMA and PCC alternates.

The results of the 63 LCCAs are as follows:

- HMA was the low-cost option for 57 construction projects
- PCC was the low-cost option for six construction projects

Two projects have signed exception forms because an option other than the low-cost option was selected for construction. Nine projects did not select an option for

construction because the selected option was determined by the alternate bidding process.

A table of LCCA results and copies of the LCCAs submitted by MnDOT districts is attached.

Discussion

Typically, hot mix asphalt is the low cost option in the submitted LCCAs. Often it's difficult for Portland Concrete Cement options to be competitive with HMA options for projects in these funding categories. PCC options usually have a greater initial cost than HMA, but become competitive by having lower maintenance costs. However, the relatively short design lives of these rehabilitation-type projects do not allow PCC options to exploit this relative advantage. PCC options with longer design lives than HMA alternates are more competitive than the PCC options with the equal design lives required by the statute.

To ensure MnDOT is designing the most efficient PCC pavements, studies have been initiated to develop new PCC design procedures. Recently, new programs for the design of PCC pavements on aggregate base and on existing HMA have been developed. These programs are currently being evaluated and standards are being developed for their implementation. Another study is developing a new procedure to design PCC pavements that can be built on top of existing PCC pavements.

To create competition and to get the most cost-effective pavement, MnDOT has continued using the alternate bidding process on projects that are likely to have competitive HMA and PCC options. A LCCA is still performed, as required by Technical Memorandum 10-04-MAT-01, but the option constructed is selected through the alternate bidding process.

The alternate bidding process is similar to using a LCCA to determine the low-cost option. However, instead of using an estimate for the initial cost of an option, alternate bidding uses actual bid prices. The process is as follows:

1. MnDOT lets a project with two options, one HMA and one PCC.
2. MnDOT calculates a maintenance factor. This is the difference between the maintenance costs of the two options.
3. MnDOT receives bids and determines the low-cost bidder after adding the maintenance factor to the alternate with the greater maintenance costs.

Conclusion

MnDOT implemented the requirements of Minn. Stat. 174.185 through Technical Memorandum 10-04-MAT-01, and has provided the required results in this report. MnDOT will continue to work to ensure that all future projects meet the requirements of the legislation.

In addition, MnDOT is innovating methods to design and select the most cost-effective pavement structure. Innovations include developing new pavement design procedures and refining the alternate bidding process to allow bidders of both pavement materials to bid on a project.