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AN ECONOMIC EVALUATION BASED ON TOTAL COST AND AGGREGATE BASE VS. ASPHALT BASE IN THE FDOT ROAD CONSTRUCTION OPERATION

PROBLEM STATEMENT

On the majority of highway projects let by the Florida Department of Transportation (FDOT), bidders traditionally have been allowed to choose the base material that they would use to construct the project if they were awarded the contract. The choice usually comes down to an aggregate (usually limerock) base or a hot-mix asphalt (HMA) base. In the past, deciding which alternative method to use was mainly based on a direct cost comparison based on unit prices of materials, labor, and equipment. When using only this direct cost parameter, in most cases, the limerock alternative appears to be the most cost effective. However, comprehensive information is required to determine all the various pertinent parameters and to perform an economic evaluation of these two alternatives that will enable FDOT to determine the best alternative based on overall cost. Such an economic evaluation would enable FDOT to make more reasonable and informed decisions based on total cost/benefit parameters.

OBJECTIVES

The objectives of this project were to develop, evaluate, and validate a model to determine which alternative (limerock base or asphalt base) would be the best choice economically, based on total cost. When considering total cost, the length of time to complete the project is an especially critical factor in terms of cost-effectiveness. If limerock base construction takes longer than HMA base construction, then the road user cost (RUC) and the construction engineering and inspection (CE&I) cost become important factors in determining a base option. Consequently, if RUC and CE&I cost are taken into account, then limerock base may not always prove to be the most cost-effective option.

FINDINGS AND CONCLUSIONS

The direct cost difference between the two base options was calculated by applying the unit price per structural number (SN). This method is valid to determine the direct cost difference between two options within the same optional base group, especially when historical data are not available.

The production rate of HMA base construction for three active projects was determined. The projects included both urban and rural projects. The statistical analysis showed that the production rates are consistent if the number of lifts is the same.

Researchers developed and employed a cost decision tool (CDT) which determined that project location is a significant factor because high Annual Average Daily Traffic (AADT) causes high RUC, which is a decisive factor in total cost comparison. The actual field case studies were conducted for the purposes of (1) reporting the findings in the calculation of RUC for projects with lane closures in the work zone and (2) comparing two popular methods for performing this calculation.

Even though the direct costs of limerock base were lower than the direct costs of HMA base, researchers found that limerock base is not always more economical when considering total cost. High RUC and CE&I costs may justify the use of HMA base: the higher the AADT and the longer the expected duration of base construction, the more likely it is that HMA is the most economical choice for base material.

BENEFITS

The research team developed a tool that compares the total costs of limerock base and HMA base. This tool, called a Cost Decision Tool (CDT), will provide users with economic evaluations for limerock and HMA base options. Economic evaluation derived by using the CDT will enable the FDOT practitioner to make more reasonable and better-informed decisions based on total cost/benefit parameters—which translate into cost savings.

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