

**Missouri DOT Pavement Design and Type Selection Process
An Independent Peer Review by The Transtec Group, Inc.**

MoDOT PIONEERS A FAIR PAVEMENT TYPE SELECTION PROCESS

In 2002, the Missouri Department of Transportation (MoDOT) embarked on an industry-changing program to develop a statewide fair pavement type selection process. In simple terms, MoDOT's ultimate objective is to deliver the highest safety and performance in its highway network within the available financial resources.

Internationally recognized pavement engineers at The Transtec Group conducted a peer review of MoDOT's Pavement Design and Type Selection Process. The three objectives of Transtec's review were to identify program strengths, identify opportunities for improvement, and to provide recommendations for further improvement to the overall process.

On the basis of Transtec's interviews with MoDOT, FHWA, and industry stakeholders, as well as review of materials provided by the Missouri DOT, Transtec is impressed with MoDOT's standard of care in developing and implementing a new pavement type selection process. The MoDOT Pavement Team shows a thorough understanding of the process, and the team shares clearly defined common objectives. It appears that MoDOT has developed a balanced, innovative program that could serve as a national model for other highway agencies throughout the nation and beyond.

For example, MoDOT's incremental development approach is commendable. A progressive step is taken, and all involved parties are given time to review and critique, and subsequent revisions are then made. All parties involved are able to provide input, and a more consistent, universal consensus is achieved. MoDOT appears to have exceeded reasonable expectations in balancing the needs of the agency, the needs of the industry, and the needs of the traveling public whom they serve.

ACTUAL BENEFITS OF MoDOT'S PAVEMENT TYPE SELECTION PROCESS

In just the few years since MoDOT began its new Pavement Design and Type Selection Process, the DOT has realized several significant benefits in total pavement design and construction. The current status of alternate bid projects let by MoDOT as of January 2007 is as follows:

- A total of 63 Alternate Bid Projects Let (58 full depth pavements, and 5 rehabilitation) for a total of \$830.0 million
- Of the 58 full-depth pavements, 23 were awarded to asphalt bids (\$314.4 million) and 35 were awarded to concrete bids (\$466.4 million)
- Of the 5 rehabilitation pavements, 1 was awarded to an asphalt bid (\$2.6 million) and 4 were awarded to concrete bids (\$46.6 million)

MoDOT’s construction letting totals over the past four fiscal years has also shown reduced prices for asphalt and concrete. The figures below suggest increased competition has led to lower prices.

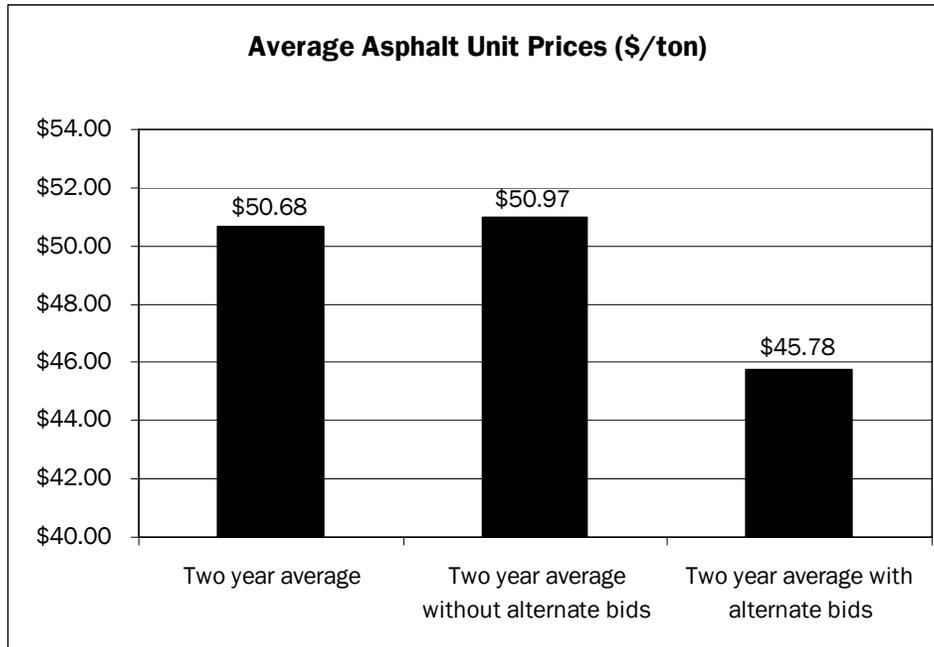


Figure 1. Asphalt bid prices with and without Alternate Bidding employed.

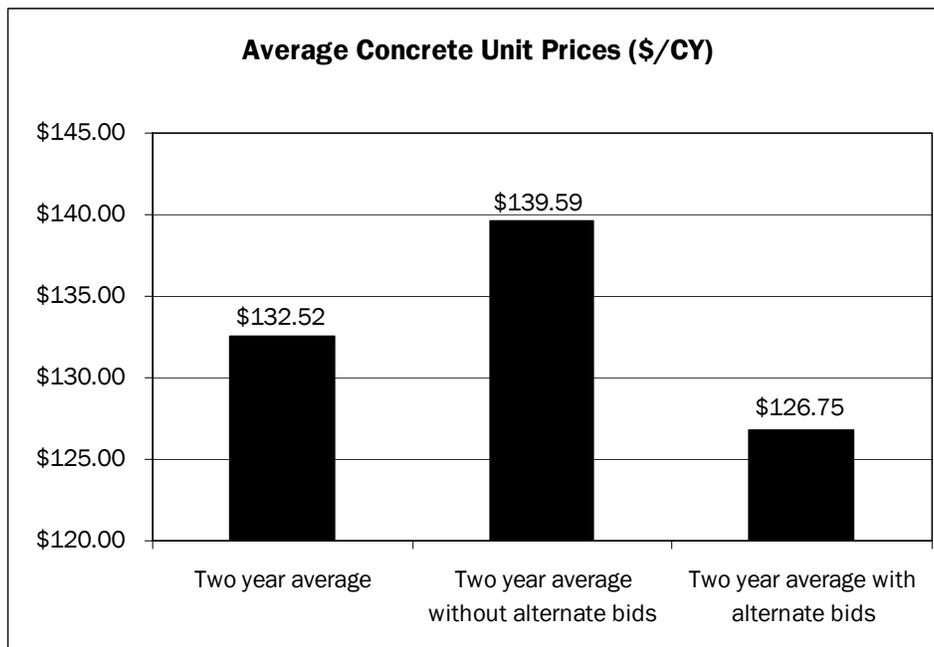


Figure 2. Concrete bid prices with and without Alternate Bidding employed.

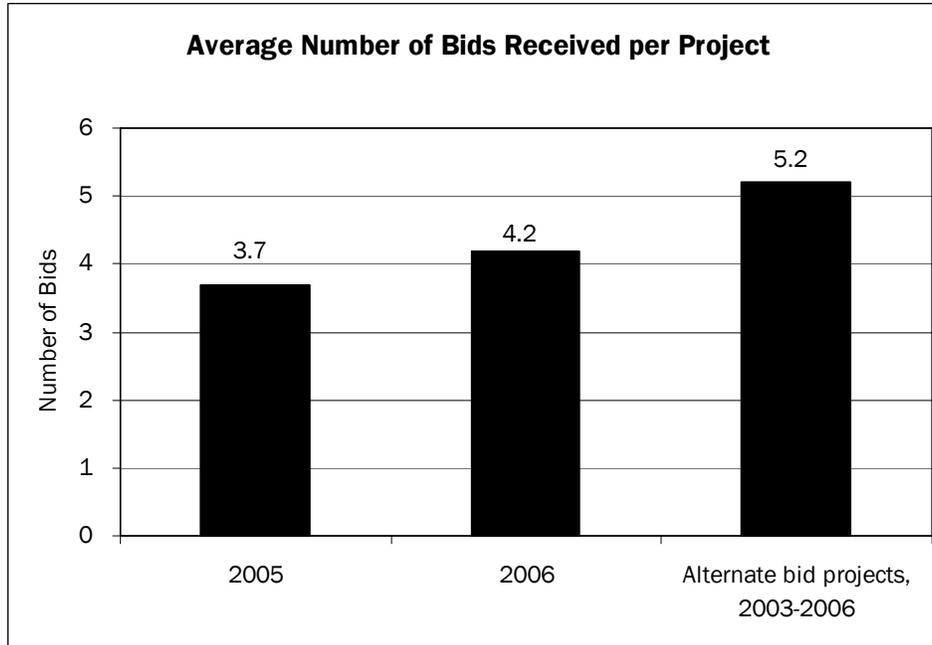


Figure 3. Increase in average number of bidders per project after Alternate Bidding employed.

MoDOT ACHIEVES AASHTO'S LONG-TERM VISION

Since 1986, the AASHTO Guide for Design of Pavement Structures (American Association of State Highway and Transportation Officials) has been organized to employ as many common inputs as possible for both asphalt and concrete pavement design. If inputs are shared, AASHTO theorized that perhaps someday, agencies could successfully select between asphalt and concrete pavements based on the true total cost. Agencies could let the industry bid on both asphalt and concrete, and award the more cost-effective option. Twenty years ago, AASHTO envisioned the first steps needed to help the national pavement community move toward Alternate Bidding. The vision continued in the 1993 version of the Guide which states the ideal goal of pavement type selection:

“If all engineering factors could be properly modeled and all costs properly compared and discounted to present value, the ultimate lowest cost pavement of whatever type or design would be the proper pavement to construct.”

The Guide, however, recognizes that pavement models are not perfect:

“The selection of pavement type is not an exact science, but one in which the highway engineer or administrator must make a judgment on many varying factors such as traffic, soils, weather, materials, construction, maintenance, and environment.”

In other words, AASHTO, as a representative of the national pavement community, identified long ago the benefits of a fair pavement type selection process, while recognizing the imperfections and limitations of such a process, as pavement models are improved and refined over time. MoDOT well understands the strengths and limitations of current state-of-the-art pavement models, and MoDOT is carefully studying and implementing pavement models that pass MoDOT's strict scrutiny.

CONCLUSIONS

MoDOT plans for ongoing refinement and improvement to its Pavement Design and Type Selection Process. As the validation process for pavement models improves, the models' reliability should increase. The best available models have some limitations and imperfections which have been identified by both industry and the DOT. MoDOT's planned Phase II activities, as outlined in MoDOT's Phase I report of March 2, 2004, address these objectives. Phase II should begin as soon as possible, to further improve MoDOT's pavement type selection process.

From the perspective of Transtec's review of the MoDOT Pavement Design and Type Selection Process, and evaluating the comments of the individuals involved, the following recommendations are offered:

- The items in the Phase II objectives should be reviewed, revised as necessary, prioritized, and a plan developed for implementation in an incremental process.
- The current limits for each distress type should continue to be refined.
- A pavement performance database should be developed on a sound statistical basis that encompasses the significant variables such as pavement type, pavement support conditions, material types, etc. These significant variables should be measured and stored in a readily retrievable format. The distress types and levels should be recorded in an established pattern (e.g., annually, biannually, etc.). The levels of distress should be recorded when an agency decision is made to rehabilitate or reconstruct. This data accumulation would provide factual credibility to the failure levels and time intervals.
- As part of the database, the cost value for each pavement should be stored and then revised appropriately when the future costs are incurred. In addition, the total costs of these events should be developed on an annual basis for use in planning, public consumption, and legislative requests.
- Since a mechanistic-empirical pavement design procedure is being used, performance based specifications should be incrementally developed that require the design parameters to be measured for the pavement acceptance process. The values are then recorded as a part of the database.

In closing, the Missouri DOT has exercised great care and diligence in developing this new process, and it is Transtec's impression that the DOT is moving in the right direction. With continued refinements and high standards of care and quality, MoDOT's pavement design and type selection process has the potential to deliver a more efficient, safe, and economical transportation system to the traveling public for generations to come.