

## **Development of a Pavement Selection Process for the ODOT.**

*(a brief history of work leading up to the formation of the Ohio Pavement Selection Advisory Council (PSAC))*

### **Attribution for this document "Development of a Pavement Selection Process for the ODOT"**

This document consists primarily of material prepared and distributed by the Ohio Department of Transportation to the Ohio Pavement Selection Advisory Council on June 18, 2003. The original ODOT document was edited by FPO to remove references to other documents distributed at the same time and an introductory and a concluding paragraph each were added to clarify the history of the project and explain the formation of the Ohio Pavement Selection Advisory Council.

### **A decision to develop a new pavement selection process**

Until fall 2001, in selecting the pavement type for its major projects, the ODOT generally had been following a de-centralized process promulgated in its policy # 515-002(P) issued in 1999. The policy established a central Pavement Selection Committee to review and approve designs and analysis performed by the districts. Consideration was to be given to life-cycle cost analysis (LCCA) and other factors in selecting the pavement type for an individual project. In practice, the results of the process were highly variable. Flexible Pavements of Ohio found itself frequently objecting to pavement type selections that were based on faulty analyses or that countered the indications of the analyses. The concrete industry apparently found ODOT's LCCA procedures so objectionable that they attempted to have the parameters legislated during hearings on the department's 2002/2003 biennium budget during the spring of 2002. ODOT leadership apparently grew weary of this criticism and decided to develop a new pavement selection process.

### **The first committee represents a false start, but a useful information-gathering step.**

In the fall of 2001, a committee was formed to develop a formalized, objective, unbiased pavement selection process and a LCCA Charter was developed. The proposed members of the committee included three representatives from the ODOT Office of Pavement Engineering, one representative from the Ohio/Kentucky Chapter of the American Concrete Pavement Association (now Ohio Concrete Construction Association, OCCA), one representative from Flexible Pavements of Ohio, two to three ODOT district representatives, ODOT Multi-Lane Coordinator, one to three representatives from ODOT Office of Construction Administration, and one representative from the Federal Highway Administration (FHWA).

Prior to the first committee meeting, the Office of Pavement Engineering (OPE) sent a survey on life-cycle cost and pavement selection procedures to 83 persons representing FHWA, both industries, and ODOT Central Office and districts. A total of 45 surveys were returned and the results tabulated. Results of the survey indicated satisfaction with the current process and agreement that a scoring system should be used to select pavement type.

The committee held the first meeting on October 30, 2001. At that meeting it was determined that the final product would be a point system modeled after the ODOT consultant selection process. Every member of the committee was urged to come to the next meeting with a list of attributes that should be considered in pavement type selection. OPE was to take the lead on developing a process for determining unit price estimates. OPE was to take the lead on a checklist and flowchart for a life-cycle

cost analysis (LCCA). The policy for when a LCCA was and was not required was to be further clarified. Districts were to research the ODOT engineering and administrative costs for a typical mill-and-fill type project.

The second meeting was held on January 7, 2002. A handout was distributed from a probabilistic LCCA showing the sensitivity of the input factors on the final net present value. The minutes do not indicate discussion of the handout. Many items were discussed as possible attributes for consideration in pavement type selection. These attributes were: ride quality, Pavement Condition Rating (PCR), lane delay, constructability, vehicle operating costs, disposal of old pavement materials, drainage, and asphalt price adjustment. Several items relating to LCCA were also discussed. These items were: smoothness incentive/disincentive, asphalt price adjustment, engineering and construction inspection costs, work zone costs, salvage value, and discount rate. No conclusions were reached on any of the items discussed but some were assigned to individuals or offices for further study.

The third meeting was held on May 1. The committee was updated on work being done to determine maintenance of traffic costs and user costs. A handout was distributed showing the analysis of the cost of disposing of old pavement materials, on-site vs. off-site. A handout was distributed showing the effect of adding 3% overhead cost to future maintenance. A demonstration of the Oman bid tab software was given and a handout was distributed showing a draft set of rules for using the software to determine unit prices. A handout was distributed showing possible attributes for a scoring system. District and industry representatives were asked to submit in writing a vision of a pavement selection process and scoring attributes that should be included and why. They were also asked to comment on if and when the industries should have input into the process.

Suggestions for a pavement selection process and scoring system were received from districts 1 and 11, and from Flexible Pavements of Ohio. District One suggested four scoring categories: LCCA, Violation of Permitted Lane Closure Times, Constructability, and District Preference. District One recommended the industries be allowed to review the LCCA prior to pavement type selection. District Eleven suggested seven scoring categories: LCCA, User Delay, Existing Subgrade, Geometrics, Number of Structures and Amount of Lighting or Signing, and District Preference. District Eleven also recommended the industries be allowed to review the LCCA prior to pavement type selection. Flexible Pavements naturally desired to review the LCCA and have input in the process prior to pavement type selection. Flexible Pavements suggested six scoring categories: Initial Cost, Life-Cycle Cost, Reconstruction after the Analysis Period, User Delay, Ride, and Noise.

Flexible Pavements also provided an innovative vision for a scoring system. They suggested the score for each item be based on three criteria. The three criteria were: importance, reliability of the data, and a spread factor. Importance would be the importance to ODOT and/or the user and would be scored on a one to ten scale with ten being the most important. Reliability of the data would be the accuracy of the data, for example, in a life-cycle cost, the initial construction quantities and costs are very accurate but the work needed in the future and associated costs are much less accurate. Reliability would be scored on a one to five scale with five being the most reliable. The spread factor would account for the differences between alternatives and be a scale of zero to one. The spread factor for cost might be 1.0 for the lowest cost alternative and 0.5 for a higher cost alternative. The score for each scoring category would be calculated by multiplying the importance times the reliability times the spread factor. The final score would be the sum of the scores for each category. The alternative with the highest score would be the selected alternative.

Shortly after the May, 1, 2002, meeting, ODOT executive leadership, disappointed with the progress of the committee, charged OPE with coming up with a new pavement selection process and scoring system with a tentative completion date of July, 31, 2002. A series of meetings began in OPE between David Humphrey, Aric Morse, Dave Miller, and Tim Bell to develop a process and scoring system.

### **Development of "Pavement Selection the ODOT Way"**

The first step was to take the scoring categories handed out at the May 1, 2002, meeting and further define them. Everyone agreed with the Flexible Pavements concept of using importance, reliability, and a spread factor to determine the score. Next the group went through the list of scoring factors and placed each in one of three broad categories: high importance, medium importance, and low importance. To determine an importance score on a scale of 1 to 10, the three broad categories were assigned point ranges. High importance was given a range of 8 - 10, medium importance was given a range of 4-7, and low importance was given a range of 1-3.

Around this same time, in discussions with district and Office of Traffic Engineering personnel, it was determined there was no difference in either pavement markings or highway lighting based on pavement type so these factors were removed from the list of scoring categories.

Next, the group assigned a reliability level from 1 to 5 for each of the factors with 5 being the most reliable. The idea was to gauge how accurate the data would be for each factor at the time of the LCCA and pavement selection. It was understood that some factors might become more accurate as plans are developed and the project nears reality, but the information may not be available for a high level of accuracy at the time a decision needs to be made. At that time, factors that were considered both low importance and reliability of one were eliminated from further consideration. The factors eliminated were: Force Account Work, and Snow and Ice Differences. The remaining factors with the assigned importance category and reliability were as follows:

- Life-Cycle Cost - high importance, reliability 4
- Initial Cost - high importance, reliability = 5
- Time for Initial Construction - high importance, reliability =3
- Time for Future Maintenance - high importance, reliability 2
- Advantages to Phasing Initial Construction - low importance, reliability =3
- Differences in Permitted Lane Closure - medium importance, reliability =4
- Subgrade Constructability - medium importance, reliability =3
- Drainage Concerns - low importance, reliability =4
- Material Quality - medium importance, reliability =2
- Late Season Paving - medium importance, reliability = 1
- Uniformity of Cross-Section - medium importance, reliability =5
- Noise - low importance, reliability = 5
- Recycle-ability - low importance, reliability =4
- Ride - medium importance, reliability = 3

The next step was to assign a single importance number within the ranges previously established. At that point it became apparent that the 1 - 10 scale for importance did not allow for enough separation of the total points (importance times reliability) of the various factors. Since the scoring factors were divided

into four general groups, Cost, User Delay, Constructability, and Environment, it was decided to add an additional weight factor to each of the groups. Cost received a weight of 40, User Delay a weight of 30, Constructability a weight of 20, and Environment a weight of 10. The total available points for each factor then became the product of weight times importance times reliability.

The final step in developing the scoring system was to define the spread factors. This was done based on the experience and expertise of the individuals involved. Then a draft of the complete process Pavement Selection the ODOT Way was developed and sent to the industries and FHWA on or about August 12, 2002. A meeting was also held with the industries on August 16, 2002, to explain the process in brief and bring attention to some of the highlights.

During development of the first draft, some numbers were adjusted after further consideration and/or new information. The primary example is User Delay for Initial Construction. The original committee had asked the Office of Traffic Engineering (OTE) to develop a method for determining user costs. As this work progressed, OTE indicated their user cost models only worked when the number of available lanes was reduced. The ODOT Policy on Maintenance of Traffic in Work Zones (516-003(P)), requires the same number of lanes be available during construction as existed prior. Because of this, OTE was unable to develop a method for determining user costs, thus the decision was made to revert back to the lane delay procedure used for many years. However, because of the work zone policy, it was decided the importance of the initial construction user delay was much lower since there would be no reduction in the number of lanes.

All the time the scoring system described above was being developed, an alternate method of pavement selection was also pursued. This method used a filtering system to eliminate alternatives that were too costly, then proceeded to score remaining alternatives on non-economic factors. The first filter was life-cycle cost. Only alternatives within 10% of the lowest cost alternative would advance for further consideration. If none were within 10%, the lowest cost alternative was selected and no further analysis was needed. The second filter, for alternatives within 10% life-cycle cost, was initial cost. Again, only alternatives within 10% of the lowest initial cost alternative would advance for further consideration. If none were within 10%, the lowest initial cost alternative was selected and no further analysis was needed. All alternatives surviving the two filters were considered economically equal and the selection decision moved to a point system based on non-economic factors. This method was presented to the Pavement Selection Committee and was rejected and not pursued further or presented to the industries.

Both industries and FHWA reviewed the 1st draft and returned comments. OKCPA provided a binder full of information, comments from other individuals, research reports, etc.

ODOT summarized the industry comments and responded to them individually. The complete document, Pavement Selection the ODOT Way, was then rewritten and sent to the industries and FHWA on or about December 17, 2002 (2nd Draft).

The industries were given time to review the 2nd draft and each was scheduled to come and meet with the Pavement Selection Committee on January 21, 2003. They were asked to submit written comments one week prior to the meeting.

ODOT again summarized the comments and reiterated any previous response to the same comments. OPE then provided a recommendation, the PSC discussed each item and made a determination and a

final resolution of each comment was decided. Also developed were the business rules used by the Office of Estimating to determine unit prices for pavement selections. Then the entire document, Pavement Selection the ODOT Way, was revised to include all the changes previously agreed to (Final **ODOT Way**). Finally, a process was developed for considering and implementing changes to the pavement selection process.

After considering the business rules for determining unit prices developed by the Estimating, it was decided to develop matrices of unit prices for asphalt and concrete items. The price matrices will be used for all life-cycle cost analyses so there can be no disagreement over the prices used.

### **Establishment of the 'Pavement Selection Advisory Council'**

During the spring of 2003, the concrete paving interests took their complaints to the legislature during consideration of the 2004/5 biennium ODOT budget bill and gas tax increase. (for more information on this attack, see the article in the FPO April newsletter titled " Concrete Paving Association Attempts to Tack Amendments on to Gas Tax Bill"). However, in response to these attacks, the Department proposed and the legislature enacted into law the establishment of a commission and the use of a neutral third-party consultant to review "Pavement Selection the ODOT Way". The law became effective on July 1, 2003 and thus the Pavement Selection Advisory Council has been established. For current information on the PSAC see its web site [www.ohiopavmentselection.org](http://www.ohiopavmentselection.org).