A2D05: Committee on General Issues in Asphalt Technology
Chairman: Byron E. Ruth

Asphalt Technology

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During the past century, highway transportation has evolved from the "out of the mud" era to one in which a network of highways provides multiple levels of service from uncontrolled to controlled access. Improvements in asphalt technology have played a key role in expanding the highway network, as well as in expediting pavement maintenance and rehabilitation operations with minimal delays to the traveling public. The goal in developing highways has been and will be to achieve ultimate comfort, safety, and efficiency for highway users in a cost-effective way.

The challenges that face the engineer and the asphalt industry are multifaceted—some are straightforward; others are complex, requiring new concepts and appropriate direction to achieve solutions. In reaching for the goal, specific areas will be explored through special programs and research efforts by government agencies, the highway construction industry, engineering consultants, and universities. Anticipated development of improved technology for asphalt pavement systems is discussed here in categories of technical areas of interest.

IMPROVED DRAINAGE

Poor surface and subsurface drainage conditions adversely affect driver safety and pavement performance. Unfortunately, insufficient emphasis has been placed on this problem during design and construction. It is envisioned that remote sensing methods, combined with nondestructive test methods, will be developed to identify critical moisture zones. Improved drainage design to facilitate installation and to provide effective surface and subsurface drainage will eliminate current deficiencies in drainage systems.

IMPROVED AGGREGATE QUALITY AND GRADATION

Lack of high-quality aggregates is becoming a major problem in many areas. As quality aggregates become depleted, the need for selecting proper test methods and gradations for base courses and asphalt mixtures becomes more important. Because the performance of these materials depends on their strain tolerance under varying microclimate conditions (moisture, freeze-thaw, and temperature) and loading conditions, it will be necessary to use test methods that relate directly to their behavior. In the future, aggregate gradation deficiencies (e.g., gap graded, excess fines) will be minimized by the elimination of broad acceptance criteria and the development of gradation requirements that relate to structural behavior. This minimization of deficiencies, combined with improved test methods, will enhance the achievement of high-quality aggregate blends before evaluation in an asphalt mixture design process. The result will be simplification and reduction in testing efforts to attain better pavement performance and durability.

INTEGRATED TEST METHODS

Mix design, quality control and quality assurance (QC/QA), and construction requirements must be revised to provide continuity of test parameters among different functions. Current QC/QA methods provide a measure of uniformity that is indirectly related to quality. It is essential that shear strength, tensile strength, and other behavior-related test methods be used to develop criteria defining in-service behavior of asphalt paving mixtures. Laboratory compaction and testing methods applicable to mix design, quality control, and construction will be developed in the new millennium. A laboratory compaction test will enable the contractor to know that the specified 100 percent target density is achievable with conventional pneumatic or vibratory rollers. Better assurance will be provided that the pavement will not rut excessively when subjected to vehicular traffic after construction. QC/QA testing will be more direct because mixture quality based on performance parameters will enable identification of all changes in mixture properties that affect quality.

INNOVATIONS IN ASPHALT PAVEMENT CONSTRUCTION

The use of warranties for asphalt paving projects is a relatively new approach being investigated by a few states. Innovations in contracting paving projects will be of major importance in the future. As confidence is developed, the warranty period will be extended and more definitive requirements will be established to protect both the contractor and state departments of transportation. This trend will be partially affected by changes in the functioning and capabilities of new construction equipment. For example, recent changes in hot-mix asphalt transfer to the paver (transfer vehicle versus truck) have provided additional heat and mixing, which minimized segregation problems and pavement surface deficiencies by eliminating stop-go paving operations. Another example is the Michigan wedge for longitudinal joint or edge construction, which improves compaction and vehicular safety because of easier mounting characteristics.

The future provides the potential for equipment development for compaction and for multiple product paving. Compaction will be attained by one pass of a specialized compactor or by a unit built into or attached to the paver. Multiple product paving will be similar to a traveling plant or in-place hot-mix recycling, but this paving train will have the capability of placing base course and asphalt pavement at the same time. The advantages of this system will be the elimination of the effect of adverse weather conditions on the finished pavement and reduced construction time.

In addition, it is envisioned that asphalt plants will be equipped with automated sampling and testing equipment that provide to the plant operator more frequent and direct assessment of mixture quality.

IMPACTS OF VEHICLE AUTOMATION

The advent of computer-controlled, guidance-system vehicles might accentuate the severity of loading on asphalt pavements by reducing vehicle wander and concentrating wheel loads within a narrow zone of the pavement. Current asphalt mixture and pavement design requirements may be inadequate unless these automated systems are regulated to increase wander or periodically shift vehicle position to extend pavement life.