

## JANUARY 2011 MEETING

Wednesday, January 12, 2011 (1.0 PDH)

### TECHNICAL PROGRAM

#### The Role of Subbase Support in Concrete Pavement Sustainability

**Speaker:** Professor Dan G. Zollinger, Ph.D., P.E. of Texas A&M University Bryan TX, Tel. No. 979 845 9918

Dr. Zollinger is a Research Engineer at the Texas Transportation Institute and a Civil Engineering Professor at Texas A&M University. He is a licensed professional engineer in Texas and has earned his BSCE and MSCE degrees from Utah State and his Ph.D. in Civil Engineering from the University of Illinois in 1989. He serves on several technical committees related to the behavior of rigid pavements. His major areas of research include concrete pavement performance, rehabilitation, behavior, and design. He recently retired from the USAR at the rank of Lt Colonel with 39 years service.

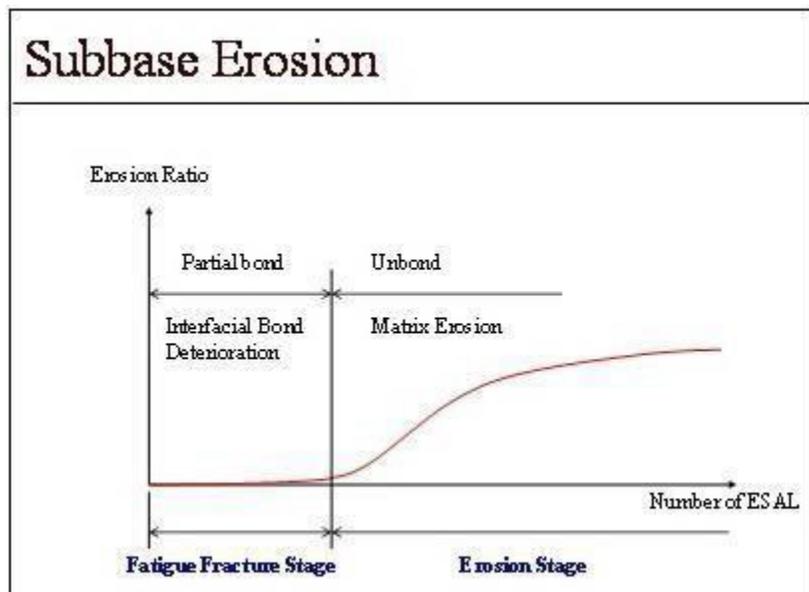
### PRESENTATION SUMMARY

To a room of about 65 at HESS, Dr. Zollinger gave a slide presentation titled, "The Role of Subbase Support in Concrete Pavement Sustainability". Dr. Zollinger described the construction of pavements and how the actions of different forces affect the integrity of those pavements. He described the mechanisms of cracks and movement on the pavements, the subbase and the sub-grade and the long term effects of those mechanisms on the life span or sustainability of the pavement. He made the point that currently most design is empirical and that new studies and design methods need to be developed.

Concrete pavement systems have great capacity to provide long service lives as long as the integrity of the subbase remains intact. If the subbase layer is improperly designed and maintained, service life may be diminished significantly to the point of non-sustainability since erosion often leads to faulting and punch-outs. Recent research has advanced the analysis of erosion development as it pertains to load induced slab deformation as a function of slab thickness, joint stiffness and spacing, and subbase thickness and stiffness as prime design factors centered at the heart of concrete pavement performance. Erosion potential is evaluated with a simple but effective laboratory test method.

Dr. Zollinger presented cost data explaining the goals behind the design life of pavements. The current goal is a pavement design life of 50 years. Current average lifespan is well short of that goal. Patching of failed pavement is a major part of the cost of pavement maintenance. Since patching is often a short lived solution, the goal is a pavement design that will avoid the need to patch.

Dr. Zollinger's presentation indicated that currently, the most effective subbase to ensure long-life in concrete pavement is an asphaltic concrete layer between the concrete pavement and the sub-grade. Since research indicates that most cracks form initially at the bottom face of the concrete pavement, this suggests a failure of the subbase material. For that reason Dr. Zollinger described the subbase material and construction as the "heart" of pavement design.



Dr. Zollinger said that most failures appear to originate at joints and edges. Edge failures appear to be driven by two main factors, lack of lateral restraint and moisture intrusion. At interior joints the main cause of failure appears to be moisture intrusion. The intrusion of moisture combined with the pumping action of traffic loads leads to erosion of the sub-grade and subbase material and eventual failure.

In conclusion, Dr. Zollinger said that the application of a layer of asphalt below the concrete pavement appears to inhibit the intrusion of moisture in the subbase which in turn slows the deterioration of the surface pavement. Alternatively, joint maintenance, which inhibits moisture intrusion may also play a key role in the pavement sustainability.

To download Dr. Zollinger's slide presentation, click [here](#).