

# PAVEMENT ANALYSIS AND DESIGN CHECKS



Previous NHI course, *Pavement Design-Principles and Practice*, is now broken down into 4 courses:

- *Pavement Analysis and Design Checks* (this course)
- *AASHTO Design Procedures for New Pavements*
- *AASHTO Pavement Overlay Design Procedures*
- *Analysis of Falling Weight Deflectometer Basins*

Course represents a partnership between these three agencies.

The preface sums up the objectives and purpose of the course.

## Course Etiquette

- Questions are encouraged at all times
- Class participation is essential
- We'll take a lot of breaks
- Keep the computers off and the lids down except during workshops

*Course etiquette must be stressed.*

It will be difficult to have a good course if these rules are not followed.

## BLOCK 1

### INTRODUCTION AND COURSE OVERVIEW

Presents a framework in which the pavement design process can be enhanced and resultant designs improved.

Introduces some of the tools that can be used:

- Using additional methodologies to check results for reasonableness.
- Examining the possible performance of those designs.
- Performing mechanistic analyses of the resultant design to identify potential shortcomings.

## Module 1-1

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### INTRODUCTION

This module discusses typical approaches to pavement design.

It also demonstrates how tools presented in course may improve the design process.

### Overall Course Objectives

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- Recognize the value of comparing designs developed by different methods
- Understand performance models and how they can be used in the design process
- Learn how mechanistic analyses can be used in pavement design
- Develop proficiency in the use of available software to analyze pavements and to check designs

Not simply taking inputs, applying to design, and constructing.

Other procedures are available for checking designs.

#### Performance Models

- Try to understand how pavement will perform.
- Does expected performance match predictions?

#### Analysis Tools for Mechanistic Design

- Computers are widely used and available.
- Familiarity with computers and computer tools for design is essential.

### Typical Design Process

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- Structural design
  - ▶ Design procedures or catalogs
  - ▶ Mechanistic-empirical models
- Plans and specifications
  - ▶ Material mix design
  - ▶ Joint details
  - ▶ Strength requirements

The typical process of design incorporates these elements in some manner.

## Advantages and Disadvantages

- **Advantages**
  - ▶ Over time, the design process, plans, and specifications are modified to meet an agency's specific conditions
- **Disadvantages**
  - ▶ The pavement design process can become too mechanical. Pavements are designed a certain way without reason

### Advantages

- Approach seems to work well
- Improved over time

### Disadvantages

- Not much thought in the design process
- Becomes too mechanical
- In reality, design process is more complex than simply using one procedure
- Success is highly dependent on conditions remaining the same

## Why Design Checks?

- The "environment" changes
- Traffic loadings continually changing
- Human errors and mistakes
- Every approach has limitations
- Improvements are constantly being sought
- Pavements are expensive, but the cost of poor performance is astronomical

### Environment changes

- New materials, such as Stone Matrix Asphalt (SMA), reclaimed asphalt pavement (RAP), and asphalt rubber come into use.

Heavier vehicles, higher tire pressures, different loading configurations.

People make mistakes. Checking can avoid or reduce the chance of mistakes.

**Every approach has limitations.**

## Available Tools

- Mechanistic analysis tools to measure or predict pavement responses from load and environment
- Mechanistic-empirical performance models
- Pavement performance models (empirical)
- Other design procedures

Course isn't suggesting that the design be done differently, but that some of the available tools be used to improve the design.

## Course Objectives

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- Perform sensitivity analysis on design inputs
- Checks on new and overlay designs using analytical tools
- Compare performance prediction model results with expected performance
- Become familiar with the assumptions, strengths, and limitations of design procedures
- Checks with design procedures

These are specific skills that participants will acquire in attending this course. These tools can be valuable for checking various pavement designs.

## Purpose of Design Checks

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### Improve Pavement Performance

The purpose of this course is to provide participants with a powerful set of tools for evaluating the adequacy of a pavement design or rehabilitation, as well as assessing its cost-effectiveness, leading to a more rational and logical approach to pavement design.

It is assumed that participants have a working knowledge of AASHTO procedure and are familiar with computers.

## Course Contents

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- Block 1: Introduction
- Block 2: AC Pavements
- Block 3: PCC Pavements
- Block 4: AC and PCC Overlays

Each block contains numerous examples and workshop problems

*View Table of Contents and course schedule.*

The emphasis is on practicality. Much time spent will be spent on workshops and hands-on activities.

Modules end with a list of references, which are a good source of further reading.

## Summary

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- **Not** a course on mechanistic design methods
- **Not** intended to resolve the mechanistic vs. empirical issue
- Does present a philosophy to follow in the pavement design process
- Presents several tools, methods, and procedures that can be used to supplement and improve the overall design process

Participation during the class and lectures is essential. Questions may be asked at any time.

What do participants expect to gain from this course? Be sure to find out what the participants expect from the class so it can be tailored to best meet their needs.

Also, find out what design procedures are currently being used by the agency for:

- PCC design?
- AC design?
- Overlay design?