Performance Based Practical Design

An FHWA Perspective
Research on PBPD and Background Materials

http://www.fhwa.dot.gov/design/pbpd/
On the NHS, design "shall consider" (previously “may take into account”)—

- constructed/natural environment
- environ., scenic, aesthetic, historic, community, & preservation impacts
- access for other modes
- cost savings via flexibility in current design guidance/regulations | NEW
FHWA Role

- Support the state’s efforts to implement PBPD
- Promote use of existing flexibilities in the application of design criteria
- Promote the use of performance analysis tools
- Provide information and resources

FHWA Strategic Implementation Plan PY 2015 National Initiative PD-5.1, and continued in current plan
What is it?

• Uses performance-analysis tools to evaluate short and long term project and system goals
• Strengthens use of Performance Management tools
What it isn’t?

• A new set of “standards” or a new process
• Significant changes to existing regulations and guidance
• An emphasis on low cost short term improvements for cost savings
• A compromise of safety for expediency or costs savings
• Project Context
  – New Construction compared to Rehabilitation and Maintenance
• Project Performance Evaluation
• Designing “Up”
• Emphasis on System Performance
PBPD recognizes that we have a mature system
- This means Designing “Up” rather than Designing “Down”

Everyone is striving to get the Best Performance within physical and fiscal constraints
- Best Performance does not always equate to meeting standards

Using Asset Management Systems to better define project scopes
• Project Objectives
  – Scope
  – Purpose & Need

• Corridor
  – Existing Conditions outside of project limits
    • Safety data
    • Operations data
    • Future plans
    • Development potential
• This means comparing proposed improvements to existing conditions
• Traditionally comparing an “as desired” facility to the proposed improvements, i.e., Designing “Down”
• Use all available inputs to project future performance of the project
  – Operational performance
  – Safety performance
  – Public Input for Context
  – Environmental Input for Context and Impacts
• Use HCS and other simulation tools to evaluate future operational performance
• Use HSM tools to evaluate future safety performance
Other PBPD Related Items
• Assumption is always use a 20 year design, implied that this is a federal requirement
  – 20 year design life is required for Interstate new construction and complete reconstruction per the AASHTO Interstate System Design Standards
  – For all other projects the AASHTO Green Book states that design life can be anything from 0 to 20 years depending on roadway type and/or project scope
The current list of controlling criteria was adopted in 1985.

Final Federal Register Notice published May 5, 2016 revising the list.

Basis was ongoing research and NCHRP Report 783: Evaluation of the 13 Controlling Criteria for Geometric Design.
FHWA Changes to Controlling Criteria

- Design speed
- Lane width
- Shoulder width
- **Bridge width**
- Horizontal alignment curve radius
- Superelevation Rate
- **Vertical alignment**
- **Maximum Grade**
- Stopping sight distance
- Cross slope
- Vertical clearance
- **Horizontal clearance**
- Design Loading Structural capacity
• **Low Speed**
  - Design Speed
  - Design Loading Structural Capacity

• **High Speed (≥ 50 mph)**
  - Design Speed
  - Design Loading Structural Capacity
  - Lane Width
  - Shoulder Width
  - Horizontal Curve Radius
  - Superelevation Rate
  - Maximum Grade
  - Stopping Sight Distance
  - Cross Slope
  - Vertical Clearance
Traditionally 30\textsuperscript{th} highest hourly traffic volume is used as the Design Hourly Volume (DHV)

- For roadways operating at less than capacity this is generally where the hourly volumes start to level off
- Research over time has shown that typically the \% of traffic in the 30\textsuperscript{th} hour remains fairly constant

There are times the 30\textsuperscript{th} hour should not be used for the DHV.
FHWA Guidance Memo eliminates tie between Legal and Design Speed
– Refers to the FHWA *Speed Concepts Informational Guide* and *NCHRP Report 504*

“Inferred design speeds less than the posted speed limit do not necessarily present an unsafe operating condition.”

• FHWA Memo, October 7, 2015 Relationship between Design Speed and Posted Speed
• Depending upon the situation there could be a difference between demand and design traffic
• Traffic modelling methods generally provide unconstrained traffic forecasts
  – Don’t take physical bottlenecks into account unless specifically added
• Concerns
  – Lack of understanding traffic forecasting outputs
  – Over design of proposed major improvements
  – Misuse of constraints to under design projects
  – Who determines if constraints are appropriate
• Implementation of the Interchange Operations Study
• Participation in several Practical Design Workshops and Virtual Peer Exchanges
• Revisions to Design Exception Processing and Submittals
• Certified Traffic Task Force
• Implementation of Revisions to
  – 23CFR625
  – FHWA Guidance on Design and Legal Speeds
  – Changes to Controlling Criteria for Geometric Design