

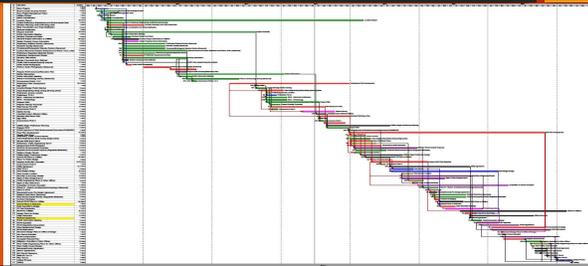
## Performance Based Practical Design

aka: "Just Good Engineering"

### Background

- The Team had 3 Criteria:
  1. Reduce the Time
  2. Increase Public Involvement (Early and Often)
  3. Reduce the Cost
- We increased public involvement, decreased the time, but we estimated the cost would increase due to clearing a wider environmental footprint.
- The decrease in time was due by moving away from a sequential handoff to working concurrently. By doing so we created a process that took 5-6 years as opposed to 9-10 years.
- With the last update we dropped the phrase "Can-Do" and just refer to it as the Project Development Process

### Project Development Process



### Today

- The issues the where the basis for the can-Do process are still an issue today:
  - On Time
  - On Budget
  - Quality/Increase Public Involvement (Early and Often)
- Performance Based Practical Design does not change the process although it does represent a significant change philosophically. If followed it should help us develop projects, on time, on budget, and high quality.

### Background

- The 6 Priority Corridors
  - Avenue of the saints
  - IA 5
  - US 151
  - IA 60
  - Des Moines to Burlington
  - Des Moines to Marshalltown
- Scheduled completion 2002
- Nearly all of the corridors saw delays in their opening date.

### Why?: Other Challenges:

- Our Mission (Getting you There)
- System Expansion (interstate study)
- System Preservation
- Transportation Asset Management
- System Operations (TSMO, LOS)
- Limited Resources and Competing Priorities (Shifting Priorities)
- How do we deliver all that and more with our existing workforce, or one with fewer people than we have today?
- What is the Future of Transportation in Iowa?

### Why?: Other Challenges: A Critical Transition in our Knowledge Base




The Generation that finished the Interstate system is on their way out.

### PBPD Is Not a Magic Wand!!




- But it may help the medicine go down!!!

### Why?: Other Challenges: A Critical Transition in our Knowledge Base




The Next Generation: Different skills, different concerns, challenges both old and new.

### How....

- PBPD is a decision-making approach that helps agencies better manage transportation investments and serve system-level needs and performance priorities with limited resources. Building upon **Context Sensitive Solutions**, flexibility in design, **Practical Design**, **Asset Management**, and **Value Engineering**, PBPD helps agencies expand the focus from cost-saving, short-term solutions to improving and evaluating overall system performance.
- At its core it simply expands the definition of Good Engineering.

### The Biggest Challenge may be our Changing Role

- Our role as providers of a transportation system is changing. The focus is no longer "Getting out of the Mud", or the construction of the "Dwight D. Eisenhower National System of Interstate and Defense Highways", otherwise known as the Interstate Highway System.
- Our role is to provide a transportation system that recognizes the needs of all users, balances the impact on the human and natural environment, and gets you there safely, efficiently and economically.

### It Builds on Previous Initiatives with Two Significant Differences:



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    graph LR
      A[NEPA Act of 1969] --> B[Context Sensitive Solutions]
      B --> C[Value Engineering]
      C --> D[Practical Design]
      D --> E[Complete Streets]
      E --> F[Performance Based Practical Design]
    
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### The First is the Tools:

- The FHWA states: "Performance Based Practical Design modifies the traditional highway design process by taking a "design up" approach where transportation decision makers exercise engineering judgment to build up the improvements from existing conditions to meet both project and system objectives. PBPD uses appropriate performance-analysis *tools*, considers both short and long term project and system goals while addressing project purpose and need."

### These Tools Combine to Create a More Comprehensive Project Concept

### The First is the Tools:

- If you review the goals and objectives of NEPA, CSS, Complete Streets, Practical Design they all encouraged a balance between, impacts, costs and purpose and need. They all encouraged a change in the philosophy of design.
- However; after much fanfare the efforts were met with limited success.
- Why?
- What the lacked was the how. The mandates were clear but the tools necessary to get engineers comfortable accommodating the new mandates were missing.

### The Number 1 concern of new engineers is being sued.

### What Are the Tools?

- AASHTO Greenbook
- Interstate Design Guide
- AASHTO and FHWA Guides on Flexibility in Highway Design
- Highway Capacity Manual
- Highway Safety Manual
- Interactive Highway Safety Design Model
- Human Factors Guide
- Data Driven Safety Analysis (DDSA)
- Highway Capacity Manual
- Iowa DOT Long Range Plan
- System Operations
  - Desired LOS
  - Freight Network
  - Identification of Select Corridors
  - Maintenance considerations
  - Evaluation of in-service performance of safety hardware
- Complete Streets Policy
- And more.....

### The Tools Provide the Basis for Alleviating That Concern:

- Documentation of decision making is key to helping designers feel comfortable about their decision.
- One of the main concerns for new engineers entering the workforce is being sued.
- The Attorney General's Office has consistently maintained if we document our decision making they can defend it.

### The Second Key Difference.....

“What’s in a name? That which we call a rose  
By any other word would smell as sweet;”

William Shakespeare; “Romeo and Juliet”

### Exercising Greater Design Flexibility; May be The Most Challenging Tool

- The AASHTO “A Guide for Achieving Flexibility in Highway Design” states the following:
  - “.. Many State Departments of Transportation (DOTs) have experienced projects in which their rigid application of established criteria, practices, or solutions has come into conflict with community values. Some examples of these conflicts include the value of mature trees versus clear zones, lane width and capacity needs versus provision for bicycle lanes, road widening to meet a prescribed level of service.....

### The Rose.....? Exercising Greater Design Flexibility

At the heart of all of these initiatives was a desire to see designers balance the impacts and minimize the costs by exercising greater flexibility when developing transportation solutions.

### The Most Challenging Tool: Exercising Greater Design Flexibility

Hmmm.....flexibility.....engineering judgement, analysis tools, purpose and need.....we’ve always done that!..

NOT NEW.  
*Not Improved.*

### Exercising Greater Design Flexibility; May be The Most Challenging Tool

- The AASHTO “A Guide for Achieving Flexibility in Highway Design” states the following:
  - Achieving a flexible, context-sensitive design solution requires designers to understand the reasons behind processes, design values, and design procedures..... In addition, the application of the concept of flexible design will vary between States and from project to project.”

### So What is New?: An Expansion of The Definition of a Good Design

- Most of our designer philosophy has centered on starting with the Preferred or Desirable end of the range.
- Why; because it has long been held that results in the safest, most efficient design, and generally what we would consider the “best” design.
- Think about it, would you prefer to buy the Desirable house, or the Acceptable one? When you chose a spouse did you select the Desirable of the Acceptable one?
- When it comes to design we are predisposed to gravitate toward the Desirable end, if nothing more because we call it desirable.

## So What is New?: An Expansion of The Definition of a Good Design

- “Performance Based Practical Design modifies the traditional highway design process by taking a “design up” approach where transportation decision makers exercise engineering judgment to build up the improvements from existing conditions to meet both project and system objectives. PBPD uses appropriate performance-analysis tools, considers both short and long term project and system goals while addressing project purpose and need.”
- A Good Design is one that improves the ability of a transportation system to fulfill its purpose and need, successfully integrates with the human and natural environment, and enhances the safety, mobility and convenience for all users.

## So What is New?

- With Performance Based Design you evaluate both how the road is performing and how you want it to perform using a variety of tools. If the analysis indicates the roadway is performing within the parameters that have been established the question becomes why do we need to make improvements beyond the basic intent of the project?
- Why upgrade geometrics?
- Why add shoulders?
- Why upgrade guardrail?
- The answer lies not in whether it meets current standards but how it is performing and how we want it to perform.

## So What Is New: Design Up vs Design Down

- Typically our approach is to start with the Preferred or Desirable end of the design criteria and adjust downward as necessary.
- With PBPD you take a somewhat opposite approach in that you focus on Purpose and Need, “Why are we Here?”, and based on a performance analysis make adjustments to address any concerns.
- It shifts from what we lose by a taking a Design Down approach, to what we gain by taking a Design Up approach.

## So What is New?

- Performance Based Design is not always cheaper. Cheaper is often the by-product, but not the goal.
  - “PBPD is a decision-making approach that helps agencies better manage transportation investments and serve system-level needs and performance priorities with limited resources.”
- Sometimes the system level needs may require an expansion beyond the initial Purpose and Need.

## So What is New? The “Why”

- In the past we started with Purpose and Need, and made adjustments as we developed the concept.
- In the future we will start with the purpose and need and make adjustments as we develop the concept.
- So what changed? The “Why” has changed.
- In the past the decision to update geometrics, guardrail, etc. was that it did not meet current standards. Now the decision will be largely based on performance, which includes safety.

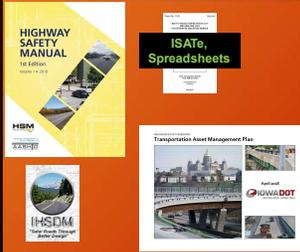
## The Approach:

- A Focus on Purpose and Need
- Evaluate System Performance and Long Range Needs
- Data Driven Safety Analysis
- A Commitment to balancing the impacts on the human and natural environment
- Design-up
- A More Comprehensive Project Concept

### What's Next?

- Complete work on Crash Modification Factors for the HSM
- Work with System Planning, and others to establish Performance Standards
- Evaluate how we might use the Human Factors Guide and the Interactive Highway Safety Design Model
- Familiarize designers with both the FHWA and AASHTO guide to flexibility in Highway Design
- Get Section Engineers involved in Concept Development
- Finish Design Manual chapter on TSMO
- Work with Traffic and Safety on the tools associated with DDSA
- Develop a Design Manual chapter on Concept development that brings all of this together.

### FHWA Initiatives



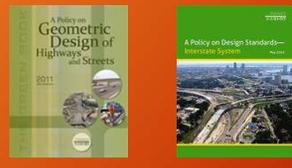
- Highway Safety Manual/ Data Driven Safety Analysis
- Asset Management
- Transportation Performance Measures

### FHWA's Role

FHWA Will be a GOOD PARTNER

**FHWA is prepared to support States as they develop projects with a system performance mindset using data-driven methods**

### What about the standards?



- Updates coming with increased flexibility
- Some research outdated
- New tools
- Availability of geospatial data

### DOTs face increasing challenges



### What about the standards?

**PBPD ≠ More Design Exceptions**

Design Exceptions

Things to Consider...



Training Available

Geometric Design: Applying Flexibility and Risk Management (2-day course)  
FHWA-NHI-380095



Questions



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