Related Terminology/Initiatives

- Design Flexibility
- Context Sensitive Design/Solutions (CSD/S)
- Complete Streets
- Hear Every Voice
- Value Engineering
- Return on Investment
- Risk Management
- CRAVE
- Engineering Judgment
Important Themes

- Money counts – choose projects with high return on investment
- Think system not just project
- Leverage and preserve existing investments
- Dig deep to discover the real problems
- Look beyond level of service and average crash rates
- Accommodate all modes
- Plan and design within the context
- Link land use and transportation investments

3 Big Reasons for Flexibility

- Address Contextual Challenges
- Serve All Modes
- Improve Return on Investment
Why Design Flexibility?

Flexibility to Address Contextual Realities

- DOT, HUD, EPA Partnership
  - Provide more transportation choices
  - Promote equitable, affordable housing
  - Enhance economic competitiveness
  - Support existing communities
  - Coordinate policies and leverage investment
  - Value communities and neighborhoods
Community Values

- Community’s cultural and social priorities
- Accommodation of all modes (bicycle, pedestrian, transit, parking)
- Economic revitalization
- Aesthetics
- Quality of life

Environmental Challenges

- Wetlands and water resources
- Parks and recreation facilities
- Air quality and noise
- Cultural and historic resources
- Natural resources
Multiple Modes Sharing Same Space

Broadening the Factors to Consider

- Physical Character
- Safety
- Capacity
- Constructability
- Cost
- Maintainability
- Public Input
- Multiple Modes
- Environmental Quality
- Cultural, Historic and Scenic Resources
- Other
Rethinking Basic Measures

- Functional Classification
- Design Speed
- Traffic Level of Service
- Crash Rates
- Capacity

Rethinking Functional Classification

- Classification tied to federal funding – required by law
- General Categories:
  - Arterial (Principal, A & B Major)
  - Collector
  - Local
One Solution Doesn’t Fit Every Context

Not All Arterials Are Alike

- Some arterials carry predominantly local traffic and have many access points
- The design speed for the arterial class can be too high for an arterial serving as the "main street" of a community
- As land uses change, so should the roadway design
Why Design Flexibility?

Land Use Based Design Guidance in lieu of Functional Classifications.

PENNDOT: Smart Transportation

PENNDOT: Smart Transportation
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Why Design Flexibility?

Broadening Measures of Effectiveness

Transportation Measures
(for all users)
- Condition
- Safety and comfort
- Mode choice
- Network connectivity
- User population
- Traditional LOS
  - Travel time
  - Congestion
  - Specific measures

Other Measures
- Environmental preservation
- Cultural Resource preservation
- Community enhancement
- Economic development
- Environmental justice/equity
- Impact mitigation
  - Noise
  - Air quality
  - Wildlife habitat

Flexibility Improves Return on Investment

Figure 2.1 Value to Price Curve

Flexibility Improves Return on Investment
Economic Changes

- Revenue sources are severely limited
- Larger system with greater maintenance requirements
- Increased construction costs
- Increased energy costs
- Increased land costs

Metro Highway Plan Revisions
Example: Missouri

Costs going up and revenues going down

Spots of perfection but fatalities increasing

“Practical Design” Initiative

• Told to put state standards on shelf and use AASHTO guidelines
• Told to base decisions on system, not project, benefits
• Told to follow three principles:
  – Every project must get safer
  – Communication among stakeholders was critical
  – Project must be practical and function properly
Missouri’s Results

- Largest drop in traffic-related fatalities of any state in the nation in 2006, with a continued downward trend every year since.
- Fatal crashes dropped below 1000 in 2007 and still further in 2008. MoDOT is on track with even better results for ‘09.
- 11% decrease in run-off-road accidents since 2004.

Missouri’s Results

- Pavement condition went from 3rd worst to 9th best in nation.
- 83% of state’s major roadways now in good condition – up from 47% in 2004.
- Customer satisfaction rose to 78% in 2008 – 95% of customers believe projects are right transportation solution.
**Why Design Flexibility?**

**BENEFITS VERSUS TIME**

- **NOW**
  - IMMEDIATE BENEFITS OF A LOW COST RETROFIT SOLUTION
- **LATER**
  - ADDDED BENEFITS OF A HIGH COST "ULTIMATE" SOLUTION

**“Retrofit” Solutions**

- Safety problems
- Capacity problems
- Emergency conditions
- Construction management
Example: Hwy 100

Flexibility Empowers Engineering Judgment
(Values change by minute degrees)

CREATE
- Produce through imaginative skill; to design something new

DESIGN
- Conceive and plan out; create for a specific function or end

ENGINEER
- Apply science and mathematics; to plan out with skill and craft

Source: Webster’s Dictionary
Design Begins with Standards

- How things should be done in normal circumstances
- Make things orderly and simple – don’t have to “re-invent the wheel” every time
- Based on vehicle performance, expected driver behavior and past successes
- Common reference point to begin a design

Engineering Judgment

- Flexibility does NOT mean there are no wrong answers
- Flexibility DOES require thought and understanding
- It requires understanding the principles underlying standards - their origin and intent re. vehicle performance and driver behavior
- It requires determining what is critical and what is optional
- It requires balancing many trade-offs
Why Design Flexibility?

**Flexibility is About Assessing Risk**

- We routinely balance many factors in design decisions
- Important to understand the degree of uncertainty, confidence, or sensitivity of factors influencing design decisions:
  - Rapidly changing land development
  - Predominant traffic type, familiarity
  - Multimodal aspects of users
  - Peak vs. off-peak traffic/safety implications

**Understand the REAL Problems**

- Use best available information
- Use an interdisciplinary process for assessing competing interests
- Apply a high level of analysis – dig deep
- Understand the scope of potential effects
- Consider both technical and non-technical factors
Structured Decision-Making Process

- Apply engineering knowledge, best practice, experience and judgment
- Apply risk assessment in a structured decision-making process
- Mitigate risks to the extent practical
- Document the decision-making process
- Gain endorsement and approvals

Tort Liability

- Be aware but not overly concerned about tort liability
- Risk as an individual is limited in Minnesota – it rests with the organization and structure for assessing risk
- Understand and apply risk assessment
- Document your decision process
Session 2

Why Design Flexibility?

Design Flexibility Guidance

- FHWA 1997
- NCHRP 2002
- AASHTO 2004 "Bridging Document"
- ITE 2006

Many Other Useful Resources

- Residential Streets
- Traffic Calming
- Geometric Design Practices for European Roads
- Leaving A Place Better Than We Found It
- Community Impact Mitigation
- Hear Every Voice

Basic Objectives of Design Flexibility

- Establish the right program – program must address urgent problems
- Establish the right projects – needs must focus on problems
- Scale solutions to the problem - right-sizing

Problem Exercise