



# Speed Management and Engineering Related Issues

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## Presentation Content *(per invitation)*

- Speed Management Concept
  - TRB Special Report 254 Managing Speed
- Engineering Aspects
  - Design Speed
  - Operating Speed
  - Speed Limit

## Acknowledgements

- TRB **Special Report 254: Managing Speed** (1998) "Review of Current Practice for Setting and Engineering Speed Limits"
- "Conceptual Approach to Relate Design Speed, Operating Speed, and Posted Speed Limits" with Kevin Mahoney and Eric T. Donnell, Pennsylvania Transportation Institute, Penn State University
- NCHRP **Project 15-25**, "Alternatives to Design Speed for Selection of Roadway Design Criteria." MRI and PTI. (D. Harwood, D. Torbic, K. Mahoney, R.J. Porter, J.M. Mason)

SPECIAL REPORT 254

# MANAGING *SPEED*

REVIEW OF  
CURRENT PRACTICE  
FOR SETTING AND  
ENFORCING SPEED LIMITS



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# Scope

- State of knowledge and practice re:
  - Setting speed limits
  - Speed : Safety
  - Road design : Speed limits
- New and emerging technologies for speed management and enforcement
- Guidance regarding current practices



# Guidance

- Relevant studies and data did **not** provide sufficient support for quantifying the effects of change in speed limits on driving speeds and safety.
- It was found that current practice of setting speed limits is a **reasonable balance** between speeds and risks under favorable operating conditions.
- **Periodic review** of driving speeds and crash experience to monitor changes over time.
- Speed limits in speed zones should be based on an **engineering study**.

# Other speed management strategies

- Roadway Design and Traffic Control
  - Designing Roads to Manage Speed
  - Traffic Calming
  - Traffic Control Devices
  - Perpetual countermeasures (reduced lane width, pavement surface roughness, markings, chevrons, delineation...)
- Vehicle and Highway Technologies
  - In vehicle displays and controls
  - Variable message / variable speeds
  - Automated Vehicle / Highway System

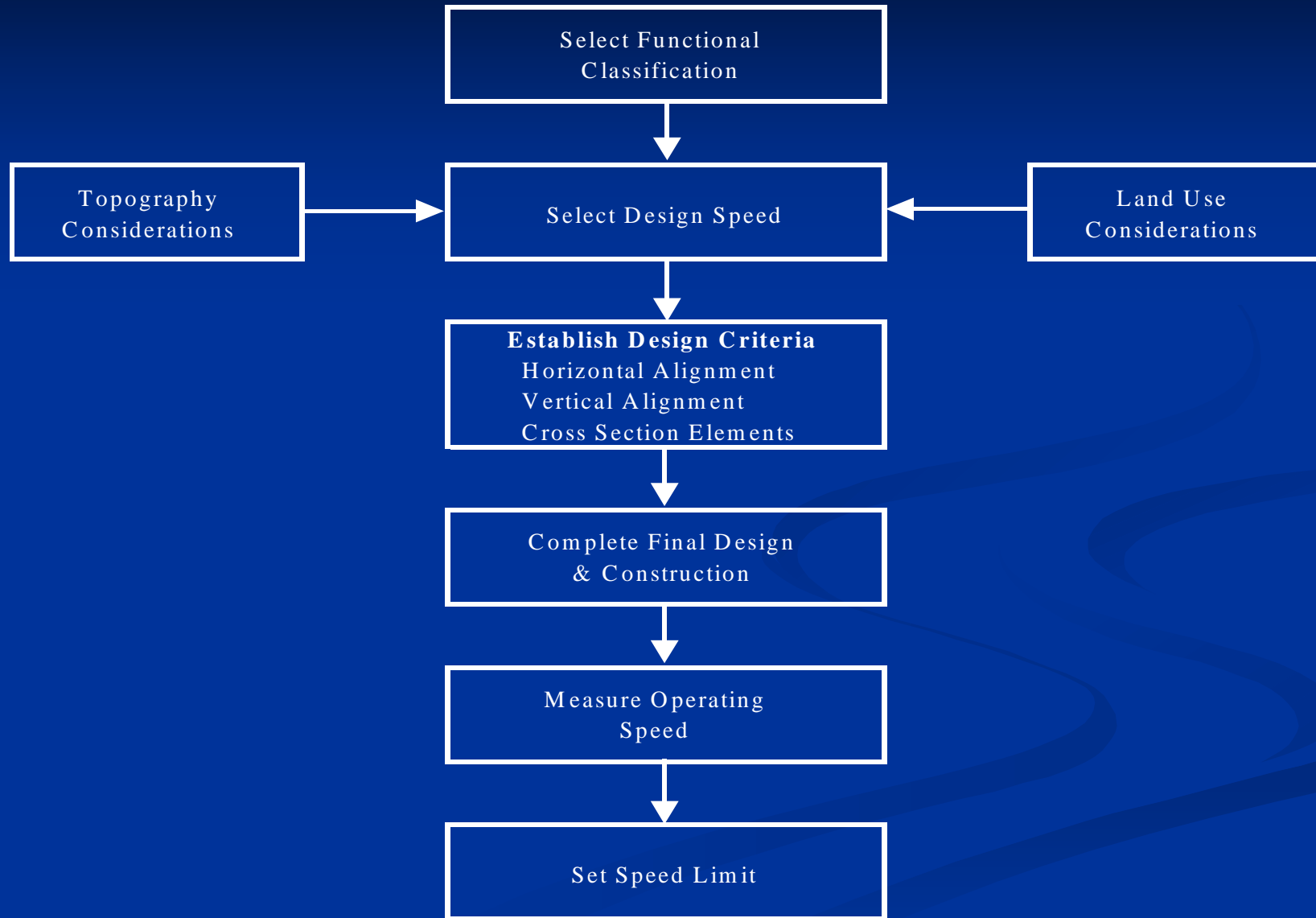
## Design Speed – Background Definitions

- AASHO (1940) ... “maximum approximately uniform speed ... by faster group of drivers.”
- AASHTO (1954 – 1994) ... “maximum safe speed ... favorable conditions ... design features govern.”
- AASHTO (2001 – 2004) ... “a select speed used to determine the various geometric design features of a roadway.”

Design Speed ↔ Operating Speed

...while an anticipated operating speed is often a consideration in design, operating speeds are typically not predicted during design...

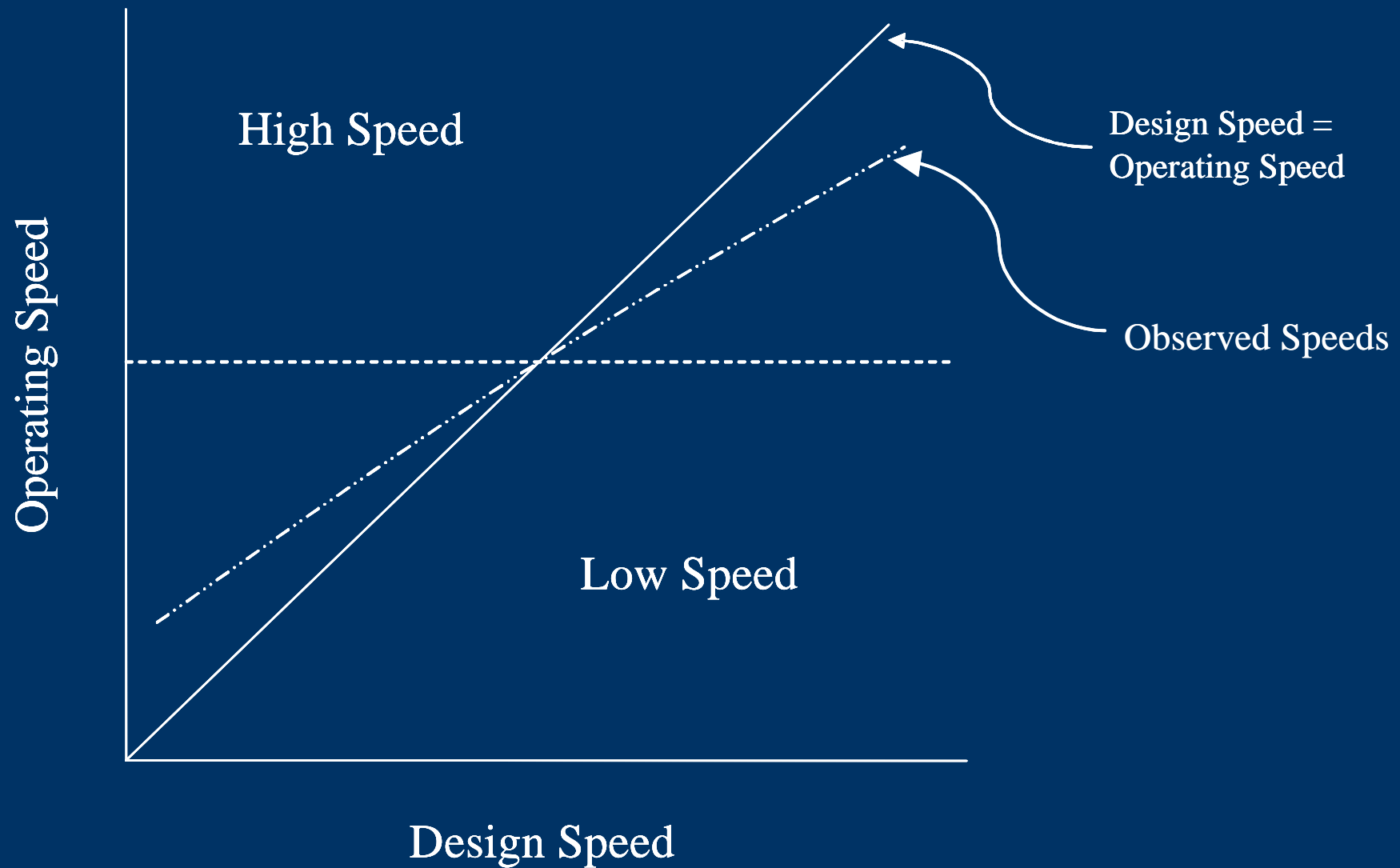
# Design Process Flow



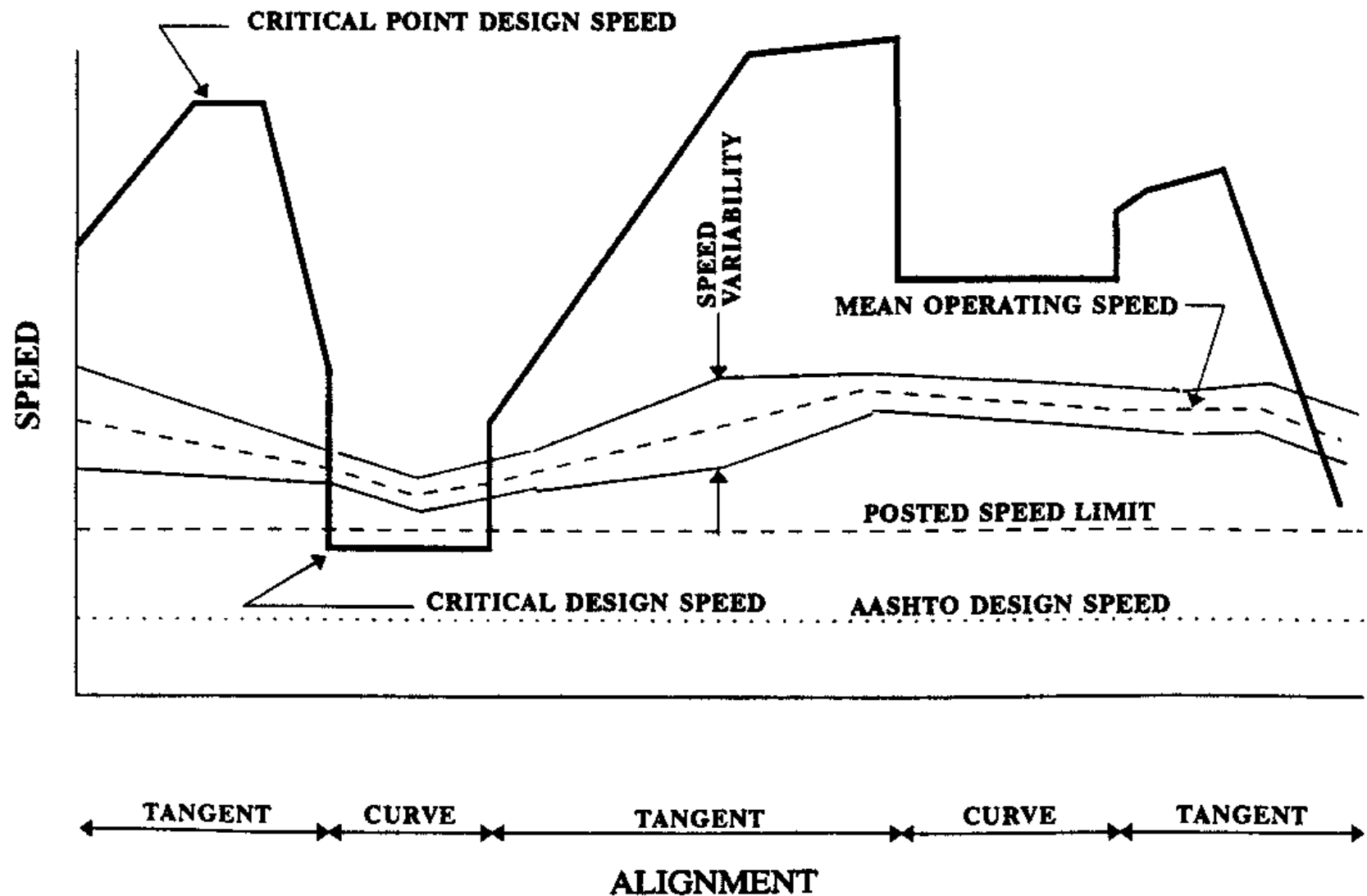
# Design elements with direct AASHTO design speed relationship:

- |                           |     |
|---------------------------|-----|
| ■ Stopping sight distance | ++  |
| ■ Horizontal curve radius | +++ |
| ■ Vertical grades         | +++ |
| ■ Lane widths             | +   |
| ■ Clear zone              | +++ |
| ■ Median type             | +++ |
| ■ Access density          | +++ |

# Relationship between Design and Operating Speed

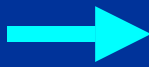


# Speed Relationships





## Selection of design speeds not directly related to operating speeds create dilemmas:

- Operating Speeds  $>$  Design speeds
- Design speeds  $\neq$  Speed Limits
- Above minimum values increases operating speeds
- Design speed : safety relationship unknown
- Continued increase for design flexibility
- "Maximum safe speed"  Tort issues

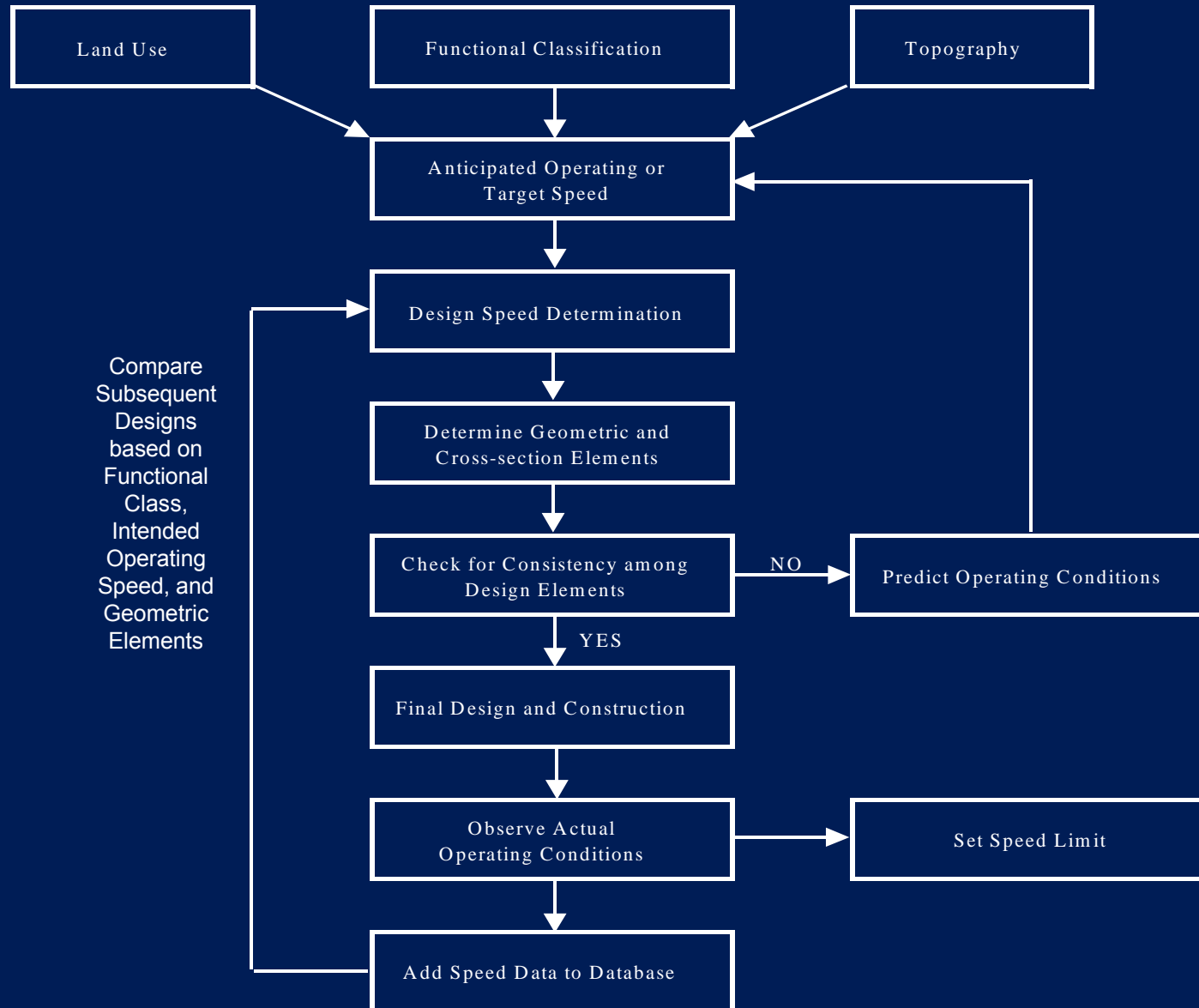
## Design Speed Concepts Experience:

- "de facto" acceptance
- "set it" then "use it"
- Subjective (flexible?)
- Conservative (safe?)
- Inconsistency with operating and ported limits
- Inconsistent alignment / geometric features
- Tort liability implications / claims

## Operating Speed Models (examples)

- Leisch & Leisch – Development of speed-profiles
- Lamm – degree of curve, tangents, 85<sup>th</sup> percentile
- Krammes – Lamm + length of curve and deflection angle
- Collins & Krammes – speed reduction, tangents and curves
- Tarris, Poe, Mason – low speed urban area: curvature, grade, hazard rating, intersections and driveway and lane width
- Polus – tangent sections
- Fitzpatrick et al. – TWOPAS and speed – profile models

# Proposed Framework to Improve Design Speed Concept



## Summary

...it is not customary U.S. practice to predict operating speeds as part of the highway geometric design process...