Good Decision Making

2022 INDOT Highway Design Conference

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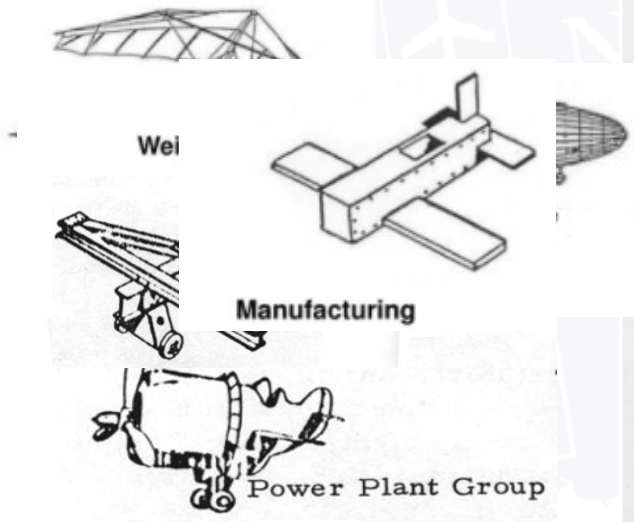
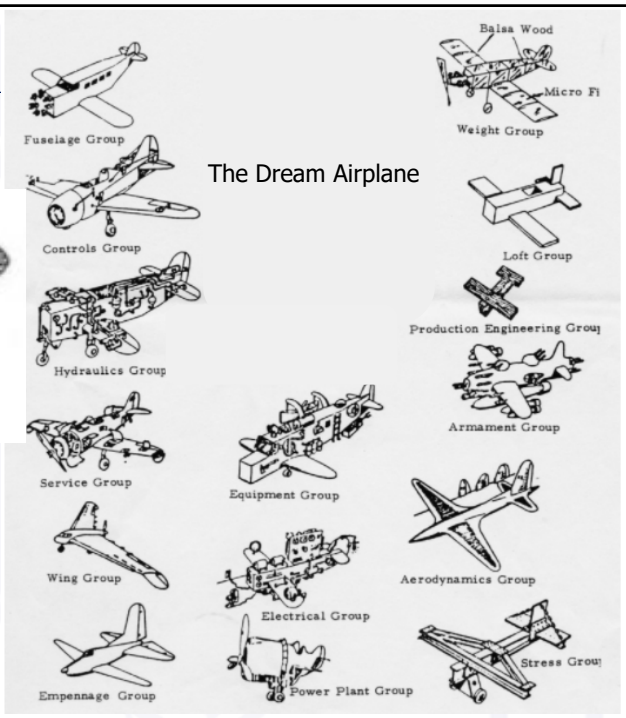
The Right Answer





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The Right Answer

- What does the right road look like?

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The Right Answer

- There is no "right" cross section or alignment
- Should consider site conditions, speed, mix of traffic, needs of the roadway as part of the transportation network, needs of the community and financial constraints.
- Understanding the effect of your decisions and documenting them is key.

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But the Design Manual Says…

PART 3

Preface

Part 3, Roadway Design, of the *Indiana Design Manual* has been developed to provide uniform design practices for Department and consultant personnel preparing contract plans for Department projects. The roadway designer should attempt to meet all criteria presented in the *Manual*. However, the *Manual* should not be considered a standard which must be met regardless of impacts.

Part 3 of the *Manual* presents most of the information normally required in the design of a roadway project; however, it is impossible to address every situation which may be encountered. Therefore, designers must exercise good judgment on individual projects and, frequently, they must be innovative in their approach to roadway design. This may require, for example, additional research in the highway literature.

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Good Judgment – Consider Downstream Effects

- Roadside and Median Barriers (Maintenance Perspective)
  - Access –
    - Ensure vegetated or any areas requiring maintenance are accessible.
    - If we decided to include two continuous runs of guardrail down the median, how will the ditching or mowing equipment gain access?
  - Barrier Type
    - If we choose w-beam guardrail over concrete barrier, will the short term construction cost savings offset the long term maintenance costs?
    - IDM: Each existing guardrail run of 300 ft or shorter which has been damaged, or gets impacted, on average, twice per year should be replaced with thrie-beam guardrail.

Why?

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Good Judgment – Guardrail at Culverts

- "I have to provide guardrail. The end is inside the clear zone"
  - Clear-zone widths are only approximate values.
    - Use engineering judgment, based on crash data when available, to determine if roadside objects, including those outside the clear zone, warrant some type of treatment.
  - Shielding a roadside object is a judgment call: Is hitting the barrier less severe than the hazard it is shielding?
    - IDM 49-3.01(01) provides a hierarchy for dealing with roadside objects. Shielding is at bottom of the hierarchy, just before delineation (object markers)
  - Consider the likelihood of an impact.
    - Hundreds of feet of guardrail is more exposure than an isolated culvert end locations.
    - Adverse roadway geometry (usually related to horizontal curvature) can increase the likelihood of leaving the travel lane
  - IDM Chapter 49 is good roadside safety guidance but does not take into account the inherent constraints of 3R work.

49-3.01(01) Range of Treatments

If an obstruction or non-traversable hazard is determined to be within the clear zone, it should be treated, in order of preference, as follows:

1. removed or redesigned so that it can be safely traversed;
2. relocated outside of the clear zone to a point where it is less likely to be hit;
3. made breakaway to reduce impact severity;
4. shielded with a traffic barrier or impact attenuator; or
5. delineated if the above treatments are not practical.

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Good Judgment – Guardrail at Culverts

- "I have to provide guardrail. The span and rise are outside of range."
  - 3R considerations Figure 55-5A(1), Clear Zone / Guardrail at Culvert
    - Context? Remember the Preface!
    - Inherently there is less likelihood of a crash on a roadway with a low AADT
- Clear zone vs. OFZ
  - Clear zone is often impractical for 3R work. Consider Obstruction Free Zone (OFZ) for culvert ends.
  - Consider incremental improvements rather than all or nothing.
    - Extensive ditch work, right of way, land disturbance are all tradeoffs to evaluate.
  - Considering extending farther if crash history indicates that a wider zone would further enhance safety.

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Good Judgment – Guardrail at Culverts

- Let the corridor be your guide.
  - Crash history is a useful tool when evaluating the likelihood of a driver leaving the roadway.
    - Is there a pattern of crashes near the culvert?
    - Is there adverse geometry? Poor sight distance?
  - Utility poles along the corridor effectively reduce the available recovery area (clear zone).
    - Headwalls and culvert ends significantly outside this offset will not likely improve the overall corridor safety performance.

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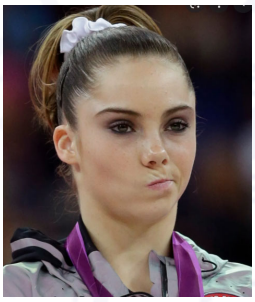
Good Decision Making – Design Exceptions

- A good decision is a documented decision.
- "we should do X, then we won't need a design exception"
  - Work toward establishing the appropriate cross section first, then document with a design exception where needed.
- "we're not sure if a design exception would be approved"
  - Approval rate is 99%.
  - Most time is spent shoring up documentation.
- Crash analysis
  - Use most recent 3-5 years of data.*
  - Answering the question "Is there a pattern of crashes correctable by improving geometric design element? If yes, then is this the project to take on that work?
  - Some crashes are random.
  - Not everything can be quantified. Narratives are important.
- B/C Ratio
  - B/C < 1 may eliminate the need for a decision exception
  - B/C > 1 may not be incorporated due to excessive cost
  - Use current costs



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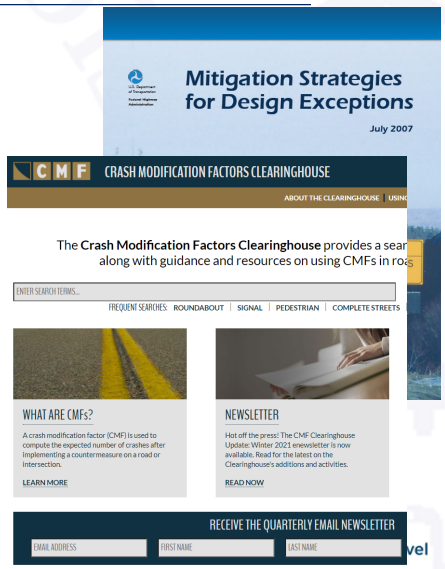
Good Decision Making – Design Exceptions

- RoadHAT
  - Is a data point, not the answer
  - Good 20,000 ft view of how a roadway is performing.
  - No value of ICC or ICF should be interpreted as a warrant to take specific action.
  - Cannot inform specific remediation.
- Mitigation
  - In the context of a design exception, mitigation is not a suggestion. It should be on the plans.
  - It's ok if not mitigation is proposed. Consider the extent of the exception when proposing a measure.
    - Example: superelevation rate is 1% substandard
      - CMF = 1
      - Truck overturning warning signs and high friction surface treatments are not warranted.
  - Consider the context of the work
    - Example: Edge line rumble stripes are a proven countermeasure for ROR crashes. Applied to a short project may not yield a substantive benefit.



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Documentation - Words Matter

- Negligence claim = demonstrating how the agency failed to design, maintain, or operate the roadway according to national guidelines or its own standards, procedures, or policy.
- Use neutral and objective language
  - Use "expected to reduce the frequency and/or severity of crashes" instead of "will make it safer or will improve safety"
- Ensure documentation is fact-based and clear and does not include opinions
- Avoid concepts and language that imply legal liability
  - "Hazardous" "High Risk" "Dangerous"
  - Have meanings of contempt or disapproval in the legal system as opposed to more neutral and objective language.
  - Non-neutral language can increase the potential for transportation agencies to be found liable for damages
- Any *unreasonable* or *undocumented* departure from established principles can result in a finding of fault against the DOT.

Source: NCHRP Legal Research Digest 83, *Guidelines for Drafting Liability Neutral Transportation Engineering Documents and Communication Strategies (2020)*

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Documentation - Words Matter

Words that Can Create Unintended Liability

Better	Insufficient
Clearly	Is needed
Concern	Mandatory
Danger/Dangerous	Obstacle
Deficient	Poor
Edge/Shoulder Drop off	Problem
Ensure	Require
Essential	Risk/Risky
Excessive	Shall
Hazard	Should
Hot Spot	Trap
Imperative	Unsafe
Inadequate	Worse

Source: NCHRP Legal Research Digest 83, *Guidelines for Drafting Liability Neutral Transportation Engineering Documents and Communication Strategies (2020)*

Liability Neutral Words and Phrases

Application of engineering judgment	Guideline
As soon as practicable	May
Criteria/factors that may be considered	Normal
Consider	Potentially contributing factors
Can	Roadside "feature" or "condition" or "object" or "device" rather than "hazard" or "risk"
Candidates for shielding	Strategy
Could	Toolbox
Difference in elevation rather than edge or shoulder drop off	When/Where feasible
Factors that contribute to the probability	

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General Questions

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