1. National Cooperative Highway Research Program

Project 20-5, Synthesis Topic 39-09

Design Flexibility Considerations for Established Cities

The AASHTO “Green Book” has long been the mainstay of road design across the country and has helped establish uniform design and implementation of road facilities. Even though the Green Book considers designs in urban areas, the fact that it is based in large part on design circumstances without, typically, right-of-way, utility, historic, built urban form, or environmental constraints creates a problem for designs in cities.

Design exceptions are a practice that has been implemented when designs need to deviate from strictly following the Green Book recommended design values. This practice can result in requiring significant time and resources and delaying the completion of the project. Typically, alternative solutions need to be developed, negotiated, approved, and shared among the responsible agencies.

The Federal Highway Administration regulation 23 CFR 625 defines the concept and elements of design exceptions for all State Transportation Agencies (STA). It has been documented that there are several practices among states and local agencies. The objective of this survey is to determine the national practice for reaching a reasonable accommodation between the idealized Green Book standards and the “built” urban environment. A secondary objective is to identify effective design strategies in an urban environment and satisfying local needs through current examples and practices.

This survey aims to understand your agency’s practices and experience with design issues in the urban core of major cities and how design exceptions are handled. The information you supply will be used to prepare a report summarizing current practice and potential effective strategies for dealing with such issues in large cities.

If you have any questions, please contact Dr. Nik Stamatiadis at 859.257.8012, or e-mail him at nstamat@engr.uky.edu.

Design exception is defined here as the process and its associated documentation for varying the values of geometric features of a roadway from those originally prescribed by the local guidelines and standards. Controlling criteria are the 13 elements that FHWA has identified as requiring a design exception and include:

- design speed
- lane width
- shoulder width
- bridge width
- structural capacity
- horizontal alignment
- vertical alignment
- grade
- stopping sight distance
- cross slope
- superelevation
- vertical clearance
- horizontal clearance (other than clear zone)

2. Part A - Agency Responsibility Overview

This part identifies the types of roadway facilities that your agency has responsibility to design, construct, maintain and/or operate.

* 1. The agency is responsible for which project phases of the following road classes.

	Planning	Design	Construction	Maintenance	Operations
Interstate	☐	☐	☐	☐	☐
NHS	☐	☐	☐	☐	☐
State	☐	☐	☐	☐	☐
Local	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

* 2. The roadway design is primarily done by

- ◯ Agency personnel
- ◯ State DOT personnel
- ◯ Consultants managed by agency
- ◯ Consultants managed by others
- ◯ Other (please specify)

* 3. In designing roadways, the agency uses the following design documents

- ◯ Design Guidelines (recommended practice but not mandatory)
- ◯ Design Standards (mandatory practice)
- ◯ Design practices based on other research/guidelines
- ◯ Other (please specify)

* 4. The urban design documents used by the agency are

- ◯ Those of the state DOT
- ◯ The Green Book
- ◯ Agency developed documents based on those of the state
- ◯ Agency developed documents based on the Green Book
- ◯ Agency documents developed based on other research/guidelines
- ◯ Other (please specify)

* 5. The design guidelines used by your agency provide adequate flexibility (without design exceptions) to meet the transportation and community needs of the urban environment.

- ◯ Yes
- ◯ No

* 6. A copy of the design standards/guidelines is available

- ◯ By mail
- ◯ Online
- ◯ Electronically

3. Part B - Need for Design Variances

This part identifies the design practices used by the agency and determines the extent of the innovation applied in designs.

* 7. The typical constraints within your urban area that require flexibility or design exceptions include

	Always	Frequently	Occasionally	Never
Right of way	◯	◯	◯	◯
Capacity	◯	◯	◯	◯
Horizontal alignment	◯	◯	◯	◯
Vertical alignment	◯	◯	◯	◯
Natural environment	◯	◯	◯	◯
Human/social environment	◯	◯	◯	◯
Pedestrians	◯	◯	◯	◯
Bicyclists	◯	◯	◯	◯
Transit	◯	◯	◯	◯
Other	◯	◯	◯	◯

* 8. Design flexibility is typically considered for the following reasons

	Always	Frequently	Occasionally	Never
Safety	◯	◯	◯	◯
Cost	◯	◯	◯	◯
Operational	◯	◯	◯	◯
Natural Environment	◯	◯	◯	◯
Human/social environment	◯	◯	◯	◯
ROW Impacts	◯	◯	◯	◯
Aesthetic	◯	◯	◯	◯
Pedestrian accommodations	◯	◯	◯	◯
Bicycle facilities	◯	◯	◯	◯
Transit	◯	◯	◯	◯
Clear zone	◯	◯	◯	◯
Other	◯	◯	◯	◯

* 9. The typical design elements that your agency modifies to deliver projects include

	Always	Frequently	Occasionally	Never
Design speed	◯	◯	◯	◯
Lane width	◯	◯	◯	◯
Shoulder width	◯	◯	◯	◯
Bridge width	◯	◯	◯	◯
Structural capacity	◯	◯	◯	◯
Horizontal alignment	◯	◯	◯	◯
Vertical alignment	◯	◯	◯	◯
Grade	◯	◯	◯	◯
Stopping sight distance	◯	◯	◯	◯
Cross slope	◯	◯	◯	◯
Superelevation	◯	◯	◯	◯
Vertical clearance	◯	◯	◯	◯
Horizontal clearance (other than clear zone)	◯	◯	◯	◯
Clear Zone	◯	◯	◯	◯
Operational Capacity	◯	◯	◯	◯
Other	◯	◯	◯	◯

4. Part C - Design Exceptions

This part identifies the design exception process, required documents for submittal, and processes for resolving conflicts.

* 10. The agency considers design exceptions for projects that may not conform to the applicable design documents.

- ◯ Yes
- ◯ No

* 11. The agency considers design exceptions for ALL types of projects.

- ◯ Yes
- ◯ No

* 12. List any project types to which this does NOT apply (check all that apply)

- ☐ Reconstruction of a roadway segment within existing right of way
- ☐ Using a curb and gutter design to reduce right of way requirements
- ☐ Intersection improvements
- ☐ Modifying design elements to address pedestrian issues
- ☐ Modifying design elements to address bicyclist access
- ☐ Altering or lowering design speed
- ☐ Using traffic calming devices
- ☐ New roadway construction
- ☐ Preventive maintenance
- ☐ Other (please specify)

* 13. The design exception documentation policy used by your agency uses only the 13 controlling criteria identified by FHWA in design exceptions.

- ◯ Yes
- ◯ No

* 14. The agency uses the following criteria in design exceptions.

- [ ] Design speed
- [ ] Lane width
- [ ] Shoulder width
- [ ] Bridge width
- [ ] Structural capacity
- [ ] Horizontal alignment
- [ ] Vertical alignment
- [ ] Grade
- [ ] Stopping sight distance
- [ ] Cross slope
- [ ] Superelevation
- [ ] Vertical clearance
- [ ] Horizontal clearance (other than clear zone)
- [ ] Clear zone
- [ ] Operational capacity
- [ ] Other (please list)

* 15. In relation to the Green Book criteria, the design values used to require design exceptions are

- ◯ The same
- ◯ More strict
- ◯ Less strict

* 16. The design exception documentation for a project is typically prepared by the

- ◯ Agency staff responsible for the design
- ◯ Agency staff supervising the design
- ◯ Consulting firm responsible for the design

* 17. Design exceptions are typically submitted during

- ◯ Planning
- ◯ Projection initiation
- ◯ Environmental permits
- ◯ Preliminary design
- ◯ 60% design
- ◯ Final design
- ◯ Plan and specifications/cost estimates

* 18. The typical time for preparing a design exception document is

◯ <1 month ◯ 1-2months ◯ 2-6 months ◯ over 6 months

* 19. The agency collects and uses the following data for inclusion in design exceptions

	Always	Frequently	Occasionally	Never
Crash history	◯	◯	◯	◯
Crash severity	◯	◯	◯	◯
Traffic volume data	◯	◯	◯	◯
Cost estimates	◯	◯	◯	◯
Crash trends	◯	◯	◯	◯
Crash Modification Factors	◯	◯	◯	◯
Before/After studies	◯	◯	◯	◯
Cost/Benefit analysis	◯	◯	◯	◯
Prior examples	◯	◯	◯	◯
Project history	◯	◯	◯	◯
Other	◯	◯	◯	◯

* 20. For design exceptions to be approved, the application is reviewed by the (check all that apply)

- ☐ Agency's legal office
- ☐ Agency's design exception committee
- ☐ Agency's design team/group
- ☐ DOT's legal office
- ☐ DOT's design exception committee
- ☐ DOT's design team/group
- ☐ FHWA
- ☐ Other (please specify)

* 21. The typical time for review/approval of a design exception document is

◯ <3 months ◯ 3-6 months ◯ 6-9 months ◯ over 9 months

* 22. The approval rate for design exceptions is typically

◯ 0-25% ◯ 26-50% ◯ 51-75% ◯ over 75%

* 23. The agency prepares and processes approximately how many design exceptions in a typical year

◯ <5 ◯ 5-10 ◯ 11-20 ◯ 21-50 ◯ >50

* 24. In the event that the design exception was not approved, the agency typically

- ◯ Negotiates a solution
- ◯ Resubmits the application
- ◯ Redesigns the project
- ◯ Proceeds with design without approval
- ◯ Other (please specify)

5. Part D - Agency Streamlining Efforts

This part addresses the agency's efforts to improve the process and utilize lessons learned.

* 25. The agency has conducted a review of design practices to determine their impact on the project development process.

- ◯ Yes
- ◯ No

* 26. List potential results of preparing design exceptions.

	Increased	Decreased	No change	NA
Project delivery time	◯	◯	◯	◯
Project costs	◯	◯	◯	◯
Potential liability exposure	◯	◯	◯	◯
Other	◯	◯	◯	◯

* 27. List potential impacts of preparing design exceptions.

	Improved	Deteriorated	No change	NA
Safety	◯	◯	◯	◯
Operational performance	◯	◯	◯	◯
Modal alternatives	◯	◯	◯	◯
Other	◯	◯	◯	◯

* 28. List the processes and/or efforts that your agency has initiated for timely resolution of design exceptions.

- ☐ Improved guidance
- ☐ Clarification of controlling criteria
- ☐ Training of staff
- ☐ Uniform document format
- ☐ Checklist of documents
- ☐ Other (please specify)

* 29. Once a design exception is granted for flexible practice, the agency uses it as a precedent for future projects.

- ◯ Yes
- ◯ No

* 30. The agency reviews projects after completion to determine their effects of design exceptions on

	Yes	No
Safety	◯	◯
Operation	◯	◯
Other	◯	◯

* 31. The agency discusses design exceptions at public meetings.

- ◯ Yes
- ◯ No

* 32. The design exception policy used by your agency provides adequate flexibility to grant a variance when needed.

- ◯ Yes
- ◯ No

* 33. The design exception policy used by your agency requires

- ◯ The appropriate amount of information
- ◯ Too much information
- ◯ Too little information

* 34. Provide a list of any problems you have experienced with the design exception process.

* 35. Provide a list of any improvements that you feel could be made to simplify the design exception process.

* 36. Provide a list of lessons learned from the design process as currently applied by your agency.

6. Part E - Case Identification

* 37. Provide a specific example where a variance was granted.

Name of the project	
Design exception justification	
Reasons for success	
Lessons learned	

* 38. Provide a specific example where a variance was NOT granted.

Name of the project	
Design exception justification	
Reasons for denial	
Lessons learned	

7. Part F - Contact Information

* 39. Please enter your contact information.

Name	
Title	
Agency	
Address	
Telephone	
Fax	
Email	