Form 740001WD
4-96

Iowa Department of Transportation

INSTRUCTIONAL MEMORANDUMS
To County Engineers

To	Date
County Engineers	December 2002
From	IM No.
Office of Local Systems	3.218
Subject	
Design Exception Process	

The purpose of this I.M. is to define the design exception process for use by the counties. After considering various factors for the type of roadway improvement, the proposed improvement may not meet one or more of the current design guides. If the County determines that a design exception is necessary, the County must submit proper justification on federally funded projects for approval to the Iowa Department of Transportation (Iowa DOT).

Step 1. DETERMINE TYPE OF IMPROVEMENT

Many factors are considered either directly or indirectly when determining the type of improvement. Some of those factors are:

A. **PAVEMENT CONDITION** The existing pavement condition and the scope of needed pavement improvements dictate, to a large extent, what improvements are practical. More significant geometric upgrading might be appropriate if the pavement improvements are substantial, but may not be appropriate or economical if the needed pavement improvements are relatively minor.

B. **PHYSICAL CHARACTERISTICS** The physical characteristics of a highway and its general location often determine what improvements are desirable, practical or cost-effective. Topography, adjacent development, existing alignment (horizontal and vertical) and cross-section (pavement width, shoulder width, side slopes, etc.) need to be considered in determining the scope of geometric or safety improvements.

C. **TRAFFIC VOLUMES** Traffic data (volume, percent trucks) are an important consideration both in the determination of the appropriate level of improvement (i.e., reconstruction vs. 3R) and in the selection of actual values for the various geometric elements.

D. **FUNCTIONAL CLASSIFICATION** Drivers associate and expect certain geometric features and levels of design with each functional class.

E. **TRAFFIC CONTROL AND REGULATIONS** Judicious use of special traffic regulations, positive guidance techniques (signs, markings) and traffic operational improvements can often forestall expensive reconstruction by minimizing or eliminating possible adverse safety and operational features of existing highways.

F. **SAFETY ENHANCEMENT** Safety enhancement is an essential consideration for all proposed projects. Federal-aid 3R projects should be developed in a manner which considers appropriate safety improvements.

G. **CRASH RECORDS** Evaluation of crash records may reveal problems requiring special attention and is an integral part of the project development process.

H. **ECONOMICS** Economic considerations are a major factor in determining the priority and scope of work. This is especially true for 3R projects which, by definition, are to prolong and preserve the service life of existing highways and enhance highway safety, in order to protect the investment in and derive the maximum economic benefit from the existing highway system.

I. **POTENTIAL IMPACTS** Projects are influenced by potential impacts on the surrounding land and development. Social, environmental, and economic impacts may limit the scope of projects. This is especially true for 3R projects where the existing right of way is narrow and there is adjacent development.

J. **OTHERS** Maximum benefit for the dollar invested, compatibility with adjacent sections of unimproved roadway, the probable time before reconstruction, and other items could be considered.

STEP 2. DETERMINE IF PROPOSED IMPROVEMENT MEETS CURRENT DESIGN GUIDES.

If the proposed improvement does not meet the design guides and the County wishes a design exception, continue to STEP 3.

STEP 3. ANALYZE THE CRASH DATA

Crash data can be analyzed using the Access-ALAS (Accident Location and Analysis System) software, which is available from the Iowa DOT Office of Traffic and Safety (515) 239-1557. Access-ALAS is also available on the internet at http://www.dot.state.ia.us/crashanalysis/. The crash data for at least the past five years should be reviewed. Review the crashes using the Access-ALAS software with respect to location, type, severity, contributing circumstances, environmental conditions, and the time period. It is often helpful to plot the crashes on a map of the roadway by location, severity and possible type.

Roadway/environment contributing circumstances should receive special attention, but those crashes with driver/vehicle contributing circumstances should not be ignored. Even if a crash is the drivers fault (drunk, speeding, ran stop sign, etc.) you should look at possibly how the roadway environment (i.e. flatter slopes, stop ahead signs, etc.) may have lessened the severity of the crash.

It is also a good idea to get a copy of the actual crash report on the fatality crashes and the crashes involving a number of injuries or those classified as major injuries. These will provide you with additional information. You may want to review these with the County sheriff to get his/her perspective. It could be beneficial to field check the locations of these high severity crashes and any locations which appear to have a high number of crashes or a high crash rate.

STEP 4. PREPARE A COST ESTIMATE TO BRING DEFICIENCIES UP TO CURRENT GUIDELINES

This estimate does not need to be precise such as a complete redesign with exact quantities being determined. It can be based on the "average" conditions as in average cross section, average right of way needed, average number of culverts extensions per mile, average cubic yards of dirt per mile and the average price of homes, buildings, wells, etc. It is suggested that this estimate be based on upgrading the deficiency to the current design aids; not to just the minimum to get by with this project.

STEP 5. CALCULATE BENEFIT TO COST RATIO ACCORDING TO I.M. 3.216

1. If the B/C is less than 0.80, then the B/C worksheet, ALAS printout, a letter stating the County's reasons for the exception including a statement of whether there are any high crash locations and the County's proposed mitigation is all that is needed.

2. If the B/C is from 0.80 to 1.20, then the six additional items listed on the review sheet in I.M. 3.216 need to be addressed in addition to the material listed previously.

3. If the B/C is over 1.20, then the exception may not be granted unless there are extenuating circumstances. An extenuating circumstance may be that the severe crashes occurred at a certain location(s) and the County proposes an improvement(s) at this location(s) and without these crashes the B/C is below 0.80. Another extenuating circumstance may be that the County doesn't have sufficient funds to do the improvement in conjunction with the project but will program it in the near future.

STEP 6. PREPARE COVER LETTER TO THE IOWA DOT REQUESTING THE EXCEPTION

Include the County's justification (reasons) and any proposed mitigation. The County may want to address some of the following items, where appropriate:

1. **Justification Portion:**

   A. **Pavement Condition**
   Example--The County has 100 miles of Hot Mix Asphalt (HMA) pavement which requires resurfacing every 10 years to 15 years in order to maintain it. It is not feasible with present funding to reconstruct the roadway each time a resurfacing is needed. When the pavement requires more than a resurfacing, upgrading will be considered.

   B. **Physical Characteristics (extent of deficiency)**
   Example--Although the foreslopes are 2:1, the ditch depths are less than 6' except for two locations. One of these locations will be guardrailed and the other is a short distance with no hazards located on the slope or in the ditch area.

   C. **Traffic Volumes**
   Example--Although the traffic volume is over 750 vpd along this 5 mile stretch, the north 3 miles is less than 750 and the south 2 miles near town is in a built up area with houses close to the road. Since it would be cost prohibitive to purchase or damage these homes, the County will conduct a speed study in this area.

   D. **Functional Classification**
   Example--This route carries, for the most part, local traffic between two communities and is not a through route in the county.

   E. **Traffic Control And Regulations**
   Example--The county had installed chevrons at the two horizontal curves three years ago. The half mile north of the city is posted under a 45 mph speed zone.

   F. **Safety Enhancement (Seven Items in I.M. 3.214)**
   Example--The bridge has had guardrail installed and the bridge rail according to the factor system in I.M. 3.213 will be delineated. All signs and markings will be in conformance with the current Manual on Uniform Traffic Control Devices (MUTCD). In checking the clear zone there is one culvert which will be guardrailed and although the power poles between Stations 100+00 and 120+00 are within the clear zone they are located as close to the right of way line as is practical.

G. **Crash Records**
Example--There are no areas with a concentration of crashes and the crash rate is below the statewide average. The one fatality crash that occurred on this route was a head-on collision near Station 110+50 which is a flat stretch and the vehicles remained on the roadway after the crash. Therefore, the vertical curves and the 2:1 slopes did not enter into this crash and if this crash is not considered in the B/C calculations, the B/C ratio is less than 0.80.

H. **Economics**
Example--To reconstruct the 15 degree horizontal curve will require either the purchase of a $120,000 house or the reconstruction and relocation of a 24' X 120' bridge. We do plan to reconstruct the curve at the time the bridge is replaced in five to ten years. Until then, curve sign with advisory speed plates and chevrons, will be installed along with the painting of edgelines.

I. **Potential Impact**
Example--The crest vertical curve in question has a cemetery on one side and a church on the other side of the road. There have been no crashes at this location. The cemetery entrance is located at the top of the crest with plenty of sight distance and the church entrance will be relocated directly across from the cemetery entrance. The "no passing zone" will be painted according to the MUTCD.

2. **Mitigation:** Examples of typical mitigation measures for various substandard design elements are shown below.

A. **Horizontal Curves**
- Curve signs or Turn signs
- Advisory speed plates
- Chevrons
- Edgelines

B. **Vertical Curves**
- No passing zone pennants
- No passing lines at height of eye per MUTCD
- Edgelines
- Relocate entrances or advance crossing signs (W11 series)
- Relocated road intersections with limited sight distance or place crossroad sign (W2-1) or side road sign (W2-2), possible with advisory speed plates
- Animal signs (W11-3 & 4) with a history of animal crashes

C. **Shoulders**
- Edgelines

D. **Slopes**
- Edgelines
- Flatten slopes with ditch depths over 6' or a traffic barrier (w-beam or cable guardrail)
- Flatten driveway slopes

E. **Grades**
- Hill signs (W7-1), if needed, as determined by percent of grade and length

F. **Narrow Bridges**
- Guardrail
- Bridge rail upgrading
- Narrow bridge signs (W5-2)
- Delineation
- Edgelines
- Object markers

G. **Clear Zone**
- Remove hazards
- Traffic barriers
- Relocate utilities as close to right of way line as possible

H. **Combinations**
- Speed study if a high crash rate
- Traffic barriers
- Spot reconstruction

STEP 7. DOCUMENT DESIGN EXCEPTION IN THE PROJECT FILE. FOR FEDERAL AID PROJECTS, SEND 2 COPIES OF THE FOLLOWING TO THE IOWA DOT DISTRICT OFFICE:

1. Cover letter stating the exception(s)
2. Analysis of the crash history with Access-ALAS printout
3. B/C ratio
4. County's reason(s) for the exception(s)
5. County's proposed mitigation(s)
6. Copies of all documentation (Access-ALAS printout, B/C worksheet, Bridge rail sheet, etc.)

STEP 8. APPROVAL/DISAPPROVAL BY THE IOWA DOT

The District Local Systems Engineer will review the design exception request and notify the County of his/her approval or disapproval of the request.