INDIANA DEPARTMENT OF TRANSPORTATION

INTER-DEPARTMENT COMMUNICATION

Standards Section – Room N642

Writer's Direct Line
232-6775

December 8, 2003

DESIGN MEMORANDUM No. 03-19
POLICY CHANGE

TO: **All Design, Operations, and District Personnel, and Consultants**

FROM: ***/s/ Anthony L. Uremovich***
Anthony L. Uremovich
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Contracts and Construction Division

SUBJECT: **Drainage in Curbed Section**

COMPLEMENTS: ***Indiana Design Manual*** **Chapters Fifty-three and Fifty-five**

EFFECTIVE: **April 20, 2004, Letting**

In Chapters Fifty-three and Fifty-five it is stated that the minimum profile grade in a curbed section is ±0.3%. Additional consideration should be given to minimum grades in curbed superelevation transition areas to avoid drainage problems. The following two criteria will alleviate such problems.

1. A minimum profile grade of ±0.5% should be maintained through a superelevation transition section.

2. A minimum edge of pavement grade of ±0.5% should be maintained through a superelevation transition section. The equations to be considered for this criterion are as follows:

$G \leq -\Delta^* - 0.5$ [Equation 03-19.1]
$G \geq -\Delta^* + 0.5$ [Equation 03-19.2]
$G \leq \Delta^* - 0.5$ [Equation 03-19.3]
$G \geq \Delta^* + 0.5$ [Equation 03-19.4]

$$\Delta^* = \frac{wne_d}{L_r}$$ [Equation 03-19.5]

where,

G = profile grade, %;
Δ^* = effective maximum relative gradient, %;
w = width of one traffic lane, m (typically 3.6)
n = number of lanes rotated;
e_d = design superelevation rate, %;
L_r = length of superelevation runoff, m.

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EXAMPLE 03-19.1

To illustrate the combined use of the two criteria, consider the following:

Δ^*= 0.65% in the transition section

Criterion 1 excludes grades between –0.5% and +0.5%.
Criterion 2 excludes grades between -1.15% (via Equation 03-19.1, where G $\leq$ -0.65 - 0.5, or -1.15), and -0.15% (via Equation 03-19.2, where G $\geq$ -0.65 + 0.5, or -0.15). Also,
Criterion 2 excludes grades between +0.15% (via Equation 03-19.3, where G $\leq$ +0.65 - 0.5, or +0.15), and +1.15% (via Equation 03-19.4, where G $\geq$ +0.65 + 0.5, or +1.15).

Therefore, the profile grade within the transition must be outside the range of –1.15% to +1.15% in order to satisfy both criteria and provide adequate pavement surface drainage.

See the AASHTO *A Policy on Geometric Design of Highways and Streets*, 2001, pp. 190-91.