

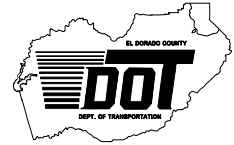


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TO: Planning Commission

Agenda of: Jan 28, 2010

Item #: 9

FROM: James W. Ware, P.E., Director of Transportation

DATE: December 28, 2009

SUBJECT: **Land Development Manual/Highway Design Manual/Standard Plans – Staff Report Supplement – Maximum Road Grades**

As a requirement of the proposed County Highway Design Manual (HDM), the El Dorado County Department of Transportation (DOT) is recommending that the centerline grade of any public street, highway or roadway (road) in El Dorado County be limited to 10% maximum, unless a Design Exception is approved by the County Engineer (see Draft HDM, Chapter 2, Topic 204.3, “Standards for Grade”). This would apply to all subdivision roadways and public facilities constructed after adoption of the HDM. Some members of the Economic Development Advisory Committee, Regulatory Reform Sub-Committee believe that this requirement is too strict, and would like to see this limitation on maximum grade increased to allow steeper grades on local residential streets.

### **DOT Recommendation**

DOT is recommending 10% maximum grade be allowed on local or collector roads. This would not prohibit design and approval of grades over 10%, but design of roads greater than 10% (up to a maximum of 15%) would require a Design Exception be prepared by a California licensed Civil Engineer and approved by the County Engineer in accordance with the DOT Design Exception Policy (See *Policy Statement* Section of the Draft HDM).

### **Reason for the Recommendation**

DOT believes that establishing a “standard” within the context of the HDM is to “allow by right” the use of such standard. DOT therefore advocates a lower maximum grade be established as the “standard”. This in no way removes the ability of a Professional Civil Engineer from exercising professional judgment in designing steeper grades, but requires additional thought and consideration prior to doing so, in the form of a Design Exception. This also allows a greater degree of review and oversight by DOT prior to approving grades that are steeper than the standard.

### **Examples of Various Road Grades**

In order for your Commission and the public to have a frame of reference and familiarity with the issues discussed in this memo, DOT measured the grades of several roadways around the Government Center as shown on the following pages.

### **Comparison of Standards from other Agencies**

Following the photographs is a comparison of other agency standards.

15% Grade Example: Fairlane Court immediately west (downhill) of Library/Ag. Driveways



12% Grade Example: Fair Lane at Raley's O/C Bridge



10% Grade Example: Fair Lane immediately South (uphill) from Apartment Driveway



**References and comparison with other agencies –**

- Existing El Dorado County Design and Improvements Standards Manual (DISM)
  - Volume II, Section 3.B.9:

The gradient of any street shall not exceed the following limits:

Arterial	To be determined by County Engineer
Major Collector	To be determined by County Engineer
Minor Collector	10%
Local, Short Loops, Dead ends, Cul-de-sacs	12%
	(May be increased to 15% for lengths not exceeding 600 feet)
Minor Land Divisions	The road gradient shall not exceed 15%

The gradient of any street (major or minor land division) above 3000' elevation shall not exceed 10%. (due to ice and snow)

- Standard Plan 101A (Commercial and Industrial Streets)
  - where ADT < 5000            12%
  - where ADT > 5000           10%
- Standard Plan 101B (Residential Local and Collector Streets)
  - where ADT < 2000            12%
  - where ADT 2000-5000       12%
  - where ADT > 5000           10%
- Standard Plan 101C (Minor Rural Residential Land Divisions)
  - where ADT < 600       12% (15% when paved)
  - where ADT > 600       13% (paving required)
- Adopted County Fire Code (California Fire Code with Local Modifications)
  - 10% unless otherwise approved by local Fire Chief (Section D103).
- Fire Safe Regulations – 16% maximum. El Dorado County set the local standards at those contained in the DISM.
- State of California Department of Transportation Highway Design Manual – Chapter 2, Table 204.3:

Type of Terrain	Freeways and Expressways	Rural Highways	Urban Highways
Level	3%	4%	6%
Rolling	4%	5%	7%
Mountainous	6%	7%	9%

- A Policy on Geometric Design of Highways and Streets, 2004, American Association of State Highway and Transportation Officials (AASHTO).

For local urban roads:

“Grades for local residential streets should be as level as practical consistent with the surrounding terrain. The gradient for local streets should be less than 15 percent.”

“For streets in commercial and industrial area, gradient design desirably should be less than 8 percent, grades should desirably be less than 5 percent, and flatter grades should be encouraged.”

For local rural roads, Exhibit 5-4. “Maximum Grades for Local Rural Roads”

Type of Terrain	Maximum grade (%) for specified design speed (mph)								
	15	20	25	30	40	45	50	55	60
Level	9	8	7	7	7	7	6	6	5
Rolling	12	11	11	10	10	9	8	7	6
Mountainous	17	16	15	14	13	12	10	10	-

Discussion on Terrain from AASHTO Policy, page 231:

“The topography of the land traversed has an influence on the alignment of roads and streets. Topography affects horizontal alignment, but has an even more pronounced effect on vertical alignment. To characterize variations in topography, engineers generally separate it into three classifications according to terrain.”

“In level terrain, highway sight distances, as governed by both horizontal and vertical restrictions, are generally long or can be made to be so without construction difficulty or major expense.”

“In rolling terrain, natural slopes consistently rise above and fall below the road or street grade, and occasional steep slopes offer some restriction to normal horizontal and vertical roadway alignment.”

“In mountainous terrain, longitudinal and transverse changes in the elevation of the ground with respect to the road or street are abrupt, and benching and side hill excavation are frequently needed to obtain acceptable horizontal and vertical alignment.

“Terrain classifications pertain to the general character of a specific route corridor. Routes in valleys, passes, or mountainous areas that have all the characteristics of roads or streets traversing level or rolling terrain should be classified as level or rolling. In general, rolling terrain generates steeper grades than level terrain, causing trucks to reduce speeds below those of passenger cars; mountainous terrain has even greater effects, causing some trucks to operate at crawl speeds.”

- Comparison of other Agencies:

Nevada County (above 3500’)	8%
Nevada County (below 3500’)	10%
Amador County (above 2000’)	10%
Amador County (below 2000’)	12%
Placer County (above 3500’)	10%
Placer County (below 3500’)	15%
Sacramento County	Uses Caltrans Highway Design Manual